Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

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Vol. 52. January, 1950. No. 613.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—**A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.**

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge 38, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

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4963
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THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. January, 1950 No. 613

EDITORIAL ANNOUNCEMENT

In beginning a new volume of RHODORA it is important to emphasize that the articles present the views and usages of their authors and that they are not to be taken as always agreeing with the interpretations of the EDITORS. This policy, enunciated at the beginning of publication of the journal, seems the right one to follow in a field where many differences of judgement are found.

OFFICIAL PLANT NAMES?

F. R. FOSBERG

As has happened before several previous botanical congresses, there seems to be at the present time a rather active movement to substitute legislative procedures for research in solving nomenclatural problems. Although botanical congresses have always decisively rejected the idea of a list of conserved specific names, several proposals have been made to create such a list at the 1950 congress. This involves a change in the basis of our system of determining the names of plants serious enough that it should be discussed so thoroughly that all of its implications are brought out. Those who vote on the matter at the congress then may know exactly to what they are opening the way should they adopt this principle.

The task of providing separate and distinctive names for a quarter of a million species of plants would, under the best of conditions, be a difficult one. Even if all the species were well-known and clear-cut, if the task were undertaken with an opportunity to survey the field and plan the whole job, if there were

neither history nor literature to deal with, it is still only too obvious that the job would not be accomplished without a considerable amount of confusion appearing in the result. The most careful of minds grow tired and the best of clerical help make errors.

How much further from ideal were the circumstances under which the members of the plant kingdom actually received their names only the person who has studied the history of systematic botany can fully realize. One need not go back into the nebulous pre-Linnaean period. Beginning with Linnaeus, who made a brilliant start by bringing together the botanical knowledge of his time into a classification that was understandable to all, by providing a simple botanical nomenclature from which homonymy (i. e., the use of the same name for two or more species) and to a certain extent synonymy (i. e., different names for the same species), were eliminated, and by providing a philosophy or set of principles (Critica Botanica: Philosophia Botanica) for the guidance of his successors, even here we find the seeds of confusion. These lie in the simple fact that even the knowledge of plants possessed by the great master was woefully incomplete.

The Linnaean system came into a rapidly expanding world. Early systematists worked during a period when plants were being discovered faster than any person could learn even their names, let alone know how they were distinguished.

These men worked also in a period when communication was infinitely more difficult than at present. They worked with scanty and fragmentary material, with little knowledge of the variability and behavior of plants, with none of the benefits of modern genetics, and with no rules or authority to follow in the naming of their plants except the principles suggested by Linnaeus. Add to this the fact that anyone who cared to could describe and name plants. Those who did included druggists, medical doctors, explorers, zoologists, compilers of dictionaries and other reference works, dealers in specimens, and horticulturists, to mention only a few of the categories other than botanists. Many of these men made valuable observations and contributions to the understanding of plants, but often they wrote in ignorance of what their botanical colleagues had already written. Too often, also, the botanists wrote in ignorance of

what these miscellaneous other workers had already published. The late eighteenth century and the early nineteenth century saw numerous attempts to bring together all plant names in the form of nomenclators or brief treatments of all known plants. These were inevitably out of date before they were published, and they were compiled, not according to any recognized set of nomenclatural principles, but according to their author's personal views on the subject or those of his institution. The last and greatest of these attempts was the Index Kewensis, which started as a nomenclator but in its later supplements acknowledged the impossibility of the task and simply listed published names. The enormous flood of plant names had finally submerged even the most optimistic of those who thought that an end must be in sight.

Meanwhile it was finally realized that in an expanding field of knowledge order could only be achieved by establishing a set of principles and rules for determining that each plant species would have only one name and that a given name would only designate one species. In 1867 an international congress of botanists adopted a code of rules for the naming of plants which, though it has been revised several times, is still in effect. From the first the basic principle in these rules has been that priority of publication is the basis for selection of one from among several names applied to the same plant. More recently has been recognized the obvious principle of determining the application of names by reference to the original (or type) material on which they were based.

These principles, despite occasional difficulty in application, are the only fundamentally objective features in the rules of nomenclature and are the bulwarks standing between an orderly and understandable system and nomenclatural anarchy. In spite of occasional wailing and gnashing of teeth at the consequences of the application of these principles, there has never, since they were made the bases of the rules, been, among botanists, any serious, widespread deliberate disregard of them. The great American Code rebellion was against looseness in the application of these principles rather than against them. It is not an overstatement to say that the functioning of the principle of priority and the type method are the main reason that botanists

can communicate with each other about plants with no serious ambiguity.

Let us examine, then, these recurrent pleas for the conservation of specific names—in other words, for the violation or abandonment of the principle of priority. What is their origin, and have their originators given sufficient thought to their consequences?

Almost invariably such proposals come from foresters, horticulturists, and other practical users of plant names, or from botanists who are in one way or another subject to pressure from these groups. Historically, it is interesting to note that much of the present-day activity in changes of plant names stems from the publications of earlier horticulturists, druggists, and other practical men. Their publications have frequently been in obscure or unlikely places and their descriptions often inaccurate or insufficient for positive identification. And these faults are by no means entirely a thing of the past.

Most of the proposals for conserved specific names specify that the list be kept small, that it be confined to trees and plants of economic importance. Trees are, I suppose, a special case because they are objects of study by foresters. Why the convenience of those interested in economic plants should be of more importance than that of non-taxonomists interested in certain other plants, i. e. morphologists, geneticists, etc. is never stated. I have not seen, so far, a practicable suggestion as to how the list is to be kept small. The hundreds of unimportant generic names proposed for conservation form an example of what may be expected. If those proposing to conserve specific names had really considered the difficulties and ramifications of what they are suggesting, they would probably find it much simpler to learn a few new names now and then rather than to solve all the problems that would arise. Let us consider the case of the name *Sequoia gigantea*, long in use for the big tree of California, surely a fit name to be conserved (see Dayton, W. A., Leafl. W. Bot. 3: 209–219, 1943), if this is a solution to the problems of name changes. There are several reasons why this name must be changed. In the first place, it does not belong to the big tree at all, but is a synonym of the name *Sequoia sempervirens*, having been first applied to the redwood. If it is conserved it obviously should be applied to the big tree, but its type

is the redwood. Of course a new type might be selected, but this would introduce a precedent of violation of the other basic principle of nomenclature that would have far-reaching consequences. The principle of "neotypes" is probably fully as dangerous to ultimate nomenclatural stability as that of violation of the principle of priority. But for argument's sake, suppose a new type were chosen that would attach the name *Sequoia gigantea* to the big tree. Are the difficulties over then? No, for Professor Bucholz has recently proposed that the big tree constitutes a different genus, *Sequoiadendron*. If this is accepted, *Sequoia gigantea* still must be discarded. Should we then insist that the epithet *gigantea* be conserved anyhow? If so it will, with its new typification, need transference to the new genus, but there it will be a later homonym, as the old *gigantea* has already been transferred there. Thus it will have to be conserved all over again, and since the newer binomial, *Sequoiadendron giganteum*, is not especially familiar, there will be much less reason for this. The wailing has all been about *Sequoia gigantea*. Perhaps we should conserve *Sequoia* also. But it has already been conserved for the redwood.

This brings up the question of whether the proposals call for the conservation of epithets or binomials. This is not clear. If it is epithets that are to be conserved, then they will be conserved in all combinations. If binomials only, then a great many of the changes that are objected to cannot be prevented in this way. Also, if a binomial is conserved, does this add its generic name to the list of nomina conservanda?

Another very obvious difficulty arises in the numerous cases where different binomials are in use in different regions for the same plant. The New Zealanders commonly use *Pinus insignis* for the Monterey pine, which is an important economic plant in their country. They might well wish to save this name and might propose it for conservation. The California botanists who have always used the correct name, *Pinus radiata*, would undoubtedly raise a violent protest, as probably would the U. S. foresters. Yet the tree is of economic importance in New Zealand and scarcely so in the U. S. Are the foresters of New Zealand to be sacrificed to the whims of a few impractical Californians just because the plant happens to come from there and

because they happen to have been correct in their use of its name? This seems to be contrary to the reasons for conservation of specific names.

The list of Nomina Generica Conservanda has been in the rules for over forty years and even yet all of its difficulties and inconsistencies are not ironed out. The problems involved in conserving generic names are relatively simple compared with those that would arise where species are concerned. If any of the proponents of conserved specific names think that this would simplify their problems, let them look over the history of the generic name list. They might well decide that it would be simpler to let strict priority operate and learn a new name now and then.

One of the most inevitable evils that would arise under such a scheme would be an attempt to substitute decision by authority for taxonomic research. (See A. C. Martin, Am. Midl. Nat. 34: 800, 1945.) Under even the best-informed authority this would be an intolerable infringement on the freedom of research. Actually, those in high official positions seldom have either the time, inclination, or ability to investigate complex nomenclatural problems well enough to understand them. Official decisions in these matters have an excellent chance of being unfortunate ones.

In repeated conversations with non-taxonomic users of botanical names it has become very evident that the annoyance with name changes is an indiscriminate one, not confined to such changes as are merely the result of discovery of older works or the typification of obscure or incorrectly applied names. There is sometimes a resentment even of cases resulting from increased taxonomic knowledge. This is comparable to resentment that modern theories as to the mechanics of the ascent of sap in trees are not those learned from the textbooks of thirty years ago. These are matters that cannot be settled by legislation any more than the principles of genetics can be regulated by the decisions of political commissars. To open the way to even a possibility of such regulation is too dangerous to be considered,.

The proposals to outlaw names that have not been used for a specified period of time (see Dayton, W. A., Jour. Forestry 41: 373, 1943; Little, E. L., Phytologia 2: 451–456, 1948) would be

less unsatisfactory but due to difficulty in determining when a name had been used, would give rise to much more of the same trouble that they seek to eliminate (see Fernald, M. L., Rhodora 50: 247–249, 1948).

It is appropriate to conclude with some pertinent remarks on the subject by an acute student, E. J. H. Corner, made after a difficult and involved study to determine the correct names for several economic species of *Artocarpus* (Gard. Bull. S. S. 10: 80, 1938):

"I find that it has been proposed by Indian foresters to conserve the name *A. integer*, or *A. integrifolia*, for the Jack of India. Hitherto the conservation of specific names has been discountenanced at Botanical Congresses, and the present instance shows what a dangerous precedent it may create. The confusion between Jack and Champedak can be ascribed only to the incompetence of systematists and their lack of acquaintance with the plants which they have tried to classify. Nor have any practical men, so far as I can ascertain, endeavored to assist systematists in this actual instance. The conservation of specific names can be accepted only if botanists agree to forego entirely their principles of priority and typification, in other words to throw over their system of nomenclature, and to adopt arbitrary names for every species. And supposing such, what is *A. integer* of India, the Chempedak or the Jack, because both species evidently grow there and have been mistaken for each other? Let us rather acknowledge the ignorance that still prevails concerning the systematy of tropical plants and direct our efforts to overcome this."

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WILLOW HYBRIDS: SALIX HEBECARPA FERNALD AND S. SIMULANS FERNALD

CARLETON R. BALL

IN an attempt at monographic treatment of American willows, it becomes necessary to study critically the various new sections, species, and varieties which have been proposed. This is a difficult and laborious task because, while no proof of validity is required when novelties are published, abundant proof of its lack must be furnished when their validity is questioned. In the interest of accurate knowledge, however, such questions must be raised.

The writer already has done this in the case of two monospecific sections (Argyrocarpae and Uva-ursi) proposed by Dr. Fernald.[1] It also has been done for new species (or names) in the case of Small's renaming of *Salix floridana* and Murrill and Palmer's publishing of *S. astatulana;*[2] of Fernald's renaming of long-established (145 years) *S. petiolaris;*[3] and of Schneider's publishing of three new species of Canadian subarctic willows, of which only *S. fullertonensis* could be maintained.[4] During this monographic work, a new "centripetal" method has been developed for the study of abundant material supposedly representing two or more different entities.[5] This method was illustrated by a study of *Salix cordata* Muhl. and *S. missouriensis* Bebb, which showed that the latter could not be maintained as a separate species. Other discussions are in press or in preparation.

Recently, it has been necessary to study two little-known species, *S. hebecarpa* Fernald, and *S. simulans* Fernald, both of which were assigned to Section Roseae by their author. Both are from the St. Lawrence River area of southern Quebec. The results presented below led to the conclusion that both are are hybrids of *S. pedicellaris* Pursh, var. *hypoglauca* Fernald.

[1] Ball, Carleton R. Studying willows or making new sections in the genus Salix. RHODORA **49**: 37–49. 1947.

[2] Ball, Carleton R. Salix floridana Chapman, a valid species. Journ. Arnold Arb. **24**: 103–106, pl. 1. 1943.

[3] Ball, Carleton R. Salix petiolaris J. E. Smith, American, not British. Bull. Torr. Bot. Club **75** (2): 178–187. 1948.

[4] Ball, Carleton R. Schneider's three new Canadian willow species (*S. anamesa*, *S. fullertonensis*, and *S. hudsonensis*). Canad. Field-Nat. **62** (5): 150–152. 1948.

[5] Ball, Carleton R. More plant study: Fewer Plant names. Journ. Arnold Arb. **27**: 371–385. 1946.

This is the only species of Section Roseae in that part of North America and they strongly resemble it in many characters, as Fernald pointed out. The resemblance is so close, in fact, that the other parent cannot be certainly identified. This frequently is the case with hybrids.

In evaluating questions of hybrid origin, some important facts about natural hybrids must be kept in mind. 1, The two parents must have about the same flowering period if wind-blown or insect-carried pollen grains from the male parent are to find receptive stigmas on the ovaries of the female plant. 2, Unless such cross pollination results in the production of fertile seeds, there can be no hybrid progeny. 3, If several or many fertile hybrid seeds are produced by the same pollen on a given plant, the plants which grow from these seeds will not all look alike, because of the laws of inheritance of differing characters. 4, There are many characters, such as size, shape, color, hairiness, toothing, division, glandulation, glaucousness, etc., for each of the many different organs of a single plant (stems, buds, stipules, leafs, peduncles, flower scales, capsules, pedicels, styles, stigmas, stamens, glands, etc.). 5, If all of the hybrid seeds were fertile and most of them produced plants, enormous diversity in the progeny would be evident. 6, In nature, many cross-pollinated ovaries produce no seeds at all, and many seeds which do form are not fertile. 7, Those hybrid plants which most nearly resemble one of the parents are most likely to produce fertile seeds. 8, As their characters are more nearly those of one parent, their progeny from different seeds will show relatively little diversity. That is why the other parent often cannot be identified.

It must be remembered also that a hybrid plant of Salix, after once becoming established, may continue to multiply vegetatively. This may be done by creeping stems, subterranean rootstocks, or even the roots themselves, all of which may produce new shoots. Later, these become independent plants when the connection decays. Spread occurs also by twigs broken off accidentally by wind, water, snow, ice, or animals, and which readily take root in soil or sand, sometimes far away from the parent plant. The new plants from this vegetative reproduction all will be like the plant from which they were

detached. With these facts in mind let us consider the two species named.

SALIX HEBECARPA FERNALD

This plant of Mt. Albert, Gaspe Peninsula, Quebec, was first published[6] in 1907 as *S. fuscescens* var. *hebecarpa* Fernald, n. var. This name was given because the more glabrous and partly creeping form was thought to be *S. fuscescens*, a prostrate willow of Alaska. In 1924, it was raised to specific rank,[7] the more glabrate and the more pubescent forms being considered a single species. Fernald discussed its charachetrs and relationships in both these papers, and again, briefly, in 1930, when publishing his second species, *S. simulans*.[8]

In 1907, Fernald stated that *S. fuscescens* Andersson, an Alaskan creeping species,—

> " . . . is abundant in bogs on the serpentine tableland of Mt. Albert. It is a very attractive creeping shrub, in foliage and other characters strongly suggesting *S. pedicellaris* Pursh . . . [but] . . . quickly distinguished by its usually obovate leaves, the more pubescent scales . . . , the very short thickish pedicels (barely exceeding the scales), the long subulate nectary which is usually half as long as the pedicel, and the definite though short style."

He then states that many colonies on Mt. Albert have the capsules quite glabrous as in the type of the species (*S. fuscescens*) while other colonies, occupying extensive areas, have the capsules distinctly pilose. Fernald and Collins No. 207, the only collection of the pubescent-capsuled form, is designated the type of the new variety *hebecarpa*, differing from the species (*S. fuscescens*) only in "pilose capsules". No reference was made then to the two collections of the creeping plant with glabrous capsules, made in 1905 and 1906. They represent the plant then held to be *fuscescens* itself.

In 1924 (l. c. above), Fernald raised his variety to specific rank as *Salix hebecarpa* (Fernald) n. comb., and included in it the more abundant glabrous-capsuled plant, which he then admitted was not *S. fuscescens* Andersson as he had thought it to be in 1907. Besides the type, pubescent-capsuled No. 207, he cites

[6] Fernald, M. L. (Some new Willows of Eastern America). *Salix fuscescens* Andersson, var. *hebecarpa* Fernald, n. var. RHODORA 9: 224. 1907.

[7] Fernald, M. L. (New or recently restudied plants of Eastern America). *Salix hebecarpa* (Fernald) n. comb. RHODORA 26: 123. 1924.

[8] Fernald, M. L. A new willow from the Côte Nord, Quebec. RHODORA 32: 112–113. 1930. (*S. simulans* Fernald, n. sp.).

three other collections, namely, the unnumbered collection of 1905, No. 206 of 1906, and a recent No. 25,686 of 1923. He states once that all three have "glabrous" capsules and once that they have "glabrous or glabrescent" capsules. He further said that, except for the pubescence of capsules, all four collections formed a "consistent series," and that *S. hebecarpa* stands between *S. fuscescens* and *S. pedicellaris* but that *S. fuscescens* has "quite different leaf-venation", and that the Alaskan shrub has darker scales and smaller capsules."

From *S. pedicellaris* Pursh (meaning var. *hypoglauca* Fernald), he says his new species " . . . is separated by its more obovate leaves, the more pubescent and darker scales . . . , the much shorter, thicker and pubescent pedicels (about equalling to twice as long as the scales), the long nectary and the definite style."

In 1930 (l. c. above), in publishing his *S. simulans*, Fernald discusses *S. hebecarpa* again and states that the name (*hebecarpa*) is a misnomer because "most specimens have the capsules glabrous or only sparsely pubescent." He notes also that the capsules are "6–8 mm. long."

Fernald never described his *S. hebecarpa*, either when publishing it as a variety in 1907 or as a species in 1924, nor in this third discussion in 1930. In all three papers he merely compared it with species in the Section Roseae. It is necessary to consider carefully the characters assigned to *S. hebecarpa* and also to *S. fuscescens* and *S. pedicellaris* (var. *hypoglauca* Fernald) in these three discussions. In raising variety *hebecarpa* to specific rank in 1923 he says that its type (No. 207) and the three collections formerly held to represent *S. fuscescens* form a "consistent series" except for the hairy capsules of the type. The consistency of the expression of the characters assigned must be considered, as well as the accuracy of the comparisons with other species. For these purposes, the writer has given critical study[9] to 1 sheet of the unnumbered collection of 1905, 6 sheets of No. 206, 6 sheets of No. 207 (type), and 6 sheets of No. 25686. Eight comparisons are analyzed.

1. *Prostrate habit.* The first character assigned to var. *hebecarpa* was "creeping shrub", which means both prostrate

[9] The curators of Gray Herbarium, and that of the Arnold Arboretum, have made available much of this material and their courtesy is greatly appreciated.

and rooting. The type, No. 207, shows rooting on the specimens of all six sheets. No. 206 shows rooting on only 4 out of 6 sheets. The unnumbered specimen of 1905 shows rooting on the one sheet seen. No. 25686 shows no rooting on any of the 6 sheets examined, and in other ways does not look like a prostrate plant. In fact, the non-rooting and often elongated apical portions of Nos. 206 and 207 and the unnumbered specimen appear to be ascending or perhaps erect rather than prostrate but this can not be certainly determined without field observations.

2. *Obovate leaves.* In 1907, the varietal type (No. 207) was said to have "leaves mostly obovate", which is correct. But in 1924, the species, then represented by four collections, was said to have "more obovate leaves" than *S. pedicellaris* (i. e., var. *hypoglauca* Fern.). Of these four collections cited, however, only the type (No. 207) has obovate leaves. The unnumbered collection of 1905 has only small elliptic-oblanceolate leaves (1 sheet); No. 206 has oblanceolate to elliptic-oblanceolate leaves with an occasional obovate leaf (6 sheets); and No. 25,686 has similar leaves (6 sheets), the largest broadly oblanceolate. Only the type, therefore, is separated from *S. pedicellaris* var. *hypoglauca* by obovate leaves, if that were a real separation. But var. *hypoglauca* also has obovate leaves. An examination of 86 specimens in the writer's herbarium shows six with leaves definitely obovate and one with leaves partly obovate.

3. *Scale Color and Hairiness.* The next separating character noted by Fernald in 1907 is "more pubescent scales" (in No. 207). In 1924 it is the "more pubescent and darker scales of the ament" in *S. hebecarpa*, which by then includes all four of the collections under discussion. *S. fuscescens* is said to have still darker scales than *S. hebecarpa.* The flower scales of *Salix* are relatively thin and tender organs greatly affected by drying. Those normally yellowish or light brown may become dark brown or blackish, through over-heating in drying. Also, scales appearing blackish by reflected light may show only varying shades of brown by transmitted light. Most of the specimens under discussion were fairly well dried.

The unnumbered specimen of 1905 has the shorter, yellowish, blunter, and almost glabrous scales of normal var. *hypoglauca*, but many of them are discolored somewhat. The other numbers

have longer, partly more acute, somewhat blackish, and more hairy scales, derived from hybridization. Those in the type, No. 207, are broader, blunter, and blacker, indicating that the other parent probably was a member of the creeping Section Ovalifoliae. Both *S. anglorum* and *S. arctophila* are common in the area.

4. *Capsule Hairiness.* In 1907, var. *hebecarpa* was separated wholly on "capsules distinctly pilose", those of the associated plants being "quite glabrous". In 1924, it was stated that "the pubescence of the fruits is by no means constant", which is true. The capsules of the three collections other than the type then are referred to once as "glabrous" and once as "glabrous or glabrescent", which also is true. In 1930, it was said that "most specimens have the capsules glabrous or only sparsely pubescent." Critical study shows that the unnumbered collection of 1905 has ovaries and capsules entirely glabrous; No. 206 has ovaries minutely puberulent to glabrous, and capsules glabrous or rarely thinly pubescent at base; and No. 25,686 has ovaries glabrous or rarely puberulent at base and capsules entirely glabrous. The type, No. 207, has ovaries white-short-pubescent and capsules thinly pubescent throughout. Several species of *Salix* with wholly glabrous capsules may have thinly pubescent ovaries.

5. *Capsule Length.* Size of capsules is not mentioned in the publishing of either variety or species, but, in the 1930 comparison with *S. simulans*, the capsules of *S. hebecarpa* are said to be "6–8 mm. long". Many measurements by the writer on all four of the collections (19 sheets) show a capsule length of 5.5–7.5 mm., but it is quite possible that 8-mm. capsules occur. Important, however, is the statement of 1924 that *S. fuscescens* has "smaller capsules" than *S. hebecarpa.* The recorded range in length of mature capsules of *S. fuscescens* is 6–8 or 9 mm. long, so that they definitely are larger, not smaller, than those of *S.* "*hebecarpa*", or those of var. *hypoglauca.*

6. *Pedicel Length and Thickness.* A point stressed in 1907 (for No. 207) was "the very short thickish pedicels (barely exceeding the scales)". In 1924, this reads (for all four collections), "the much shorter, thicker, and pubescent pedicels (about equalling to twice as long as the scales)". In the 1905 collection, the pedicels are glabrous and slender but short

(1–1.5 mm.) compared with var. *hypoglauca*, the whole plant being depauperate. In No. 206 the pedicels are 1–2 mm. long, stout to stoutish and minutely puberulent. In No. 25,686 they are more variable, 1–2 or 2.5 mm. long, stoutish to slenderish, and micro-puberulent to glabrous. On the type, No. 207, they are 1–1.5 mm. long, stoutish, and finely pubescent. Such variation hardly indicates a "consistent series" but does indicate hybrid origin. Occasional capsules on all four collections are almost sessile and on stout pedicels.

7. *Style Length.* In 1907, the style (of No. 207) was referred to as "definite though short". In 1924 (for all four collections), it was called a "definite style", which in *Salix* might mean anything from 0.3 to 3 mm. in length. Glandular structures, such as styles, stigmas, and nectaries, are more likely to be variable in length than are the firmer organs. Development is easily affected by frost and they also may shrink after maturing, even if normally developed. On the 1905 depauperate collection, the styles are 0.2–0.3 mm. long, or normal for var. *hypoglauca*. On the other three collections, they mostly are 0.4–0.8 mm. and entire, or rarely to 1 mm. long on the type.

8. *Gland Length.* In 1907, Fernald recorded "a long subulate nectary which is usually half as long as the pedicel" and in 1924 he referred to the "long nectary". The gland on the 1905 depauperate collection is 0.4–0.5 mm. long, as in var. *hypoglauca*. On the three numbered collections, the subulate or filiform gland is from 0.4–0.8 or rarely 1 mm. long, and finely capitate.

From the preceding discussion, it will be seen that the four collections studied are all variable but that they fall into two groups.

The first group has most of the characters of *S. pedicellaris* var. *hypoglauca* but shows depauperate growth. It contains only the unnumbered 1905 collection of Collins and Fernald, alpine bogs, alt. 1000 m., Mt. Albert, Gaspe Co., Quebec, Aug. 8–15, 1905, distributed as *S. myrtilloides* L. A single Gray Herbarium specimen has been studied. This is a plant 6 dm. long, 4 mm. in diameter at the base, unbranched and rooting for 38 cm., then branching and heavily fruited. Except for the rooting habit and leaves not normally reticulate, especially above, this would pass for depauperate var. *hypoglauca*. Root-

ing could be produced by heavy snow coverage and elevation, but the plant well may be a hybrid.

The second group includes the other three collections: Fernald and Collins 206 (as *S. fuscescens* Andersson) and 207 (type, as *S. fuscescens* var. *hebecarpa* Fernald, n. var.), both from alpine bogs on the serpentine tableland, alt. 1100 meters, Mt. Albert, Gaspe Co., Quebec, July 21, 1906; Fernald, Griscom, Mackenzie, & Smith 25,686, from sphagnum bog, bordering a pond at about 1050 m. altitude in the hornblende area south of Flagstaff Peak, Mt. Albert, July 24, 1923. Six sheets of each of these have been studied. The first two numbers show rooting habit in part but the third shows none. Shape of leaves varies also, as noted in discussion. All three agree in showing some puberulenec or pubescence on pedicels and capsules but both quantity and area covered vary greatly, even on the same plant. They agree also in styles 2 to 3 times as long as in var. *hypoglauca*, and also in longer stigmas and glands, and mostly stouter pedicels, but all of these characters vary greatly and on the same plant. Their strong resemblance to var. *hypoglauca*, accompanied by great variation among the three, as well as within each collection, almost certainly indicate hybrid origin. The further fact that relatively few seeds were produced in the abundant capsules, and that most of those seen seem to be infertile, is another strong indication of hybridity. As noted above, the creeping habit of two and the larger, darker, and hairier scales of all three, suggest that either *S. anglorum* or *S. arctophila* was the male parent. The capsule hairiness and longer styles also could have come from either of these parents. On Nos. 206 and 207, the most creeping collections, some of the tiny undeveloped basal leaves still are more or less densely long hairy beneath, especially toward the apex. This is characteristic of similar leaves in the creeping Section Ovalifoliae, to which the suggested male parents belong.

Some other specimens have been assigned to *S. hebecarpa*. Two of these have just been reviewed critically, with the following results.

Dutilly and Lepage 14,503, from Riviere aux Melezes (Larch River), rivage, un peu en haut de la Riviere Russell, in Labrador Peninsula, northern Quebec, Aug. 8, 1945, was determined as

S. hebecarpa by Ball. It proves to be primarily *S. arctophila* Ckll., and probably a hybrid, perhaps with *S. pedicellaris hypoglauca* by its narrower scales and long glabrate capsules.

Mackenzie and Griscom 11,048, from Green Gardens, headland of Cape St. George, western Newfoundland, July 20, 1922, was distributed as *S. cordifolia* var. *Macounii* (Rydb.) Schneider. Later it was annotated as *S. hebecarpa* Fernald by some one. It is undoubted *S. anglorum* Chamisso, the smaller than average leaves with broad bases tending toward its variety *kophophylla* Schneider.

SALIX SIMULANS FERNALD

In 1930, Fernald published[8] his *Salix simulans*, from "Open marshy area, Betchuwun, Saguenay Co., Quebec, Harrison F. Lewis (type in Gray Herbarium, Aug. 26, 1928." He states that the plant was so puzzling that he encouraged Dr. Lewis to obtain a second collection in 1929. Lewis evidently did so, but it is not cited or further mentioned in the paper. However, two sheets of it have been received from Gray Herbarium for critical study. The labels bear the habitat data given above for the 1928 type collection, except that the 1929 date is Sept. 3 (pencilled field labels) or Sept. 13 (handwritten sheet labels).

Fernald says that: "In its very tomentose and short-pedicelled capsules it would seem to belong in the § *Glaucae*,. . . . . In foliage, however, *S. simulans* is as clearly a member of the § *Roseae*." The pubescent buds and young twigs, and the thinly pubescent young leaves (beneath), also suggest Sect. Glaucae, as do the long and hairy scales. The blades, however, are not as exactly similar to those of *S. pedicellaris*, var. *hypoglauca* as Fernald would seem to indicate. Shape, color, and general appearance are much the same but the blades, even though collected in autumn, are plane to incised-reticulate above rather than raised-reticulate. The fine reticulation beneath also is not as strongly raised as is normal for var. *hypoglauca*. The primaries are distinctly raised, the secondaries moderately so, but the tertiaries often are scarcely elevated at all. Some of those not raised are fairly clearly seen, however, because they have darkened slightly in drying and so are visible through the glaucous epidermis.

Certain striking aspects of this puzzling plant strongly indicate that it is a hybrid and not a species. The plant obviously is sexually deficient, a common result of hybridity. There are five portions of the plant, from 8–12 inches long and freely branching, on these two sheets of the 1929 collection. Two portions bear 2 aments each, two bear 1 each, and the fifth bears none. Similar growth of any of the suspected parents normally would carry from three to five times as many aments. The aments also are smaller than those of species in either section named and obviously are of depauperate development.

Most important is the fact that the ovaries never had developed into capsules, although collected in September. What Fernald described as densely white-tomentose obtuse capsules 2.5–4 mm. long actually are ovaries which never developed beyond that stage. This probably was partly because of the lack of stimulation derived from fertilization and partly because of the general lack of sex vigor discussed above.

Ovaries in Salix are normally white-tomentose and blunt, even though the mature capsules become relatively thinly gray-pubescent and acute as they develop. That these are still only ovaries is proved by the fact that they are completely sterile, there being no sign of seeds and very little of the normally abundant parachute hairs which surround the seeds and usually elongate even if the seeds do not develop beyond the germ stage. Further proof that these are ovaries is seen in the fact that the two valves have not separated and recurved as most capsules would have done before that time in the autumn. Some valves have not separated at all and most of them have merely opened and the tips separated more or less widely. Only a few have reached a right angle and none have recurved in the normal manner.

Finally, there is that considerable variation in some of the organs which is a common result of hybridization. This diversity, however, is not as great as in many hybrids and might have been more apparent if there had been greater sex vigor and continued development of the organs. The longest styles and stigmas are 2 to 3 times as long as the shortest and there is considerable dividing of the styles. Diversity in the length of styles and stigmas and in the division of styles is relatively more common in Section Glaucae than in many other Sections of *Salix*.

Fernald described the flower scales as broadly oblong, 2–2.5 mm. long, apex rounded to emarginate. They vary considerably and some appear to be almost obovate and dark brown in color. Many of the leaf blades are sparsely glandular-denticulate (not "dentatis" as stated by Fernald), especially on the basal portion. Such denticulation and also obovate blackish scales are characteristic of *S. arctophila*, of the prostrate Section Ovalifoliae. Sparse denticulation occurs rarely in most species of Section Glaucae, and one (*S. McCalliana*) is normally rather closely crenulate-denticulate throughout. Whatever the male parent, it is practically certain that *S. simulans* is a hybrid.

Washington 15, D. C.

THREE ADDITIONS TO THE FLORA OF NOVA SCOTIA.—In late August and early September of 1932, accompanied by my daughter and son, I took a brief vacation, driving by conventional routes through southern New Brunswick and western Nova Scotia. Although this was not primarily a collecting-trip, it was inevitable that we should occasionally collect a few species which seemed of local interest. Upon returning to Cambridge, I began the intensive but perpetually interrupted work on a revision of Gray's *Manual*, and the little collection of plants was pigeonholed, to be retrieved only now, as the proof of the Manual is being read. Three plants collected seem not to have been reported from Nova Scotia and they are here noted.

ELEOCHARIS OVATA (Roth) R. & S., var. HEUSERI Uechtrict. CUMBERLAND Co.: sandy shore of Trueman's Pond, Treumanville, no. 1618.

POLYGONUM ACHOREUM Blake in RHODORA, xix. 232 (1917). ANNAPOLIS Co.: border of salt-marsh, Annapolis Royal, no. 2625.

When he published *Polygonum achoreum*, often a weedy species (the name meaning "without a native land"), Blake said: "the present species, although pretty certainly indigenous in the United States, has apparently never been found in a clearly native condition". On the saline marshes of Annapolis River it is an element in the regular halophytic native flora of *Suaeda*, *Salicornia*, etc.

ASTER TARDIFLORUS L. COLCHESTER COUNTY: by spring in woods near Summit Park on Route 11, about 12 miles north of Truro, no. 2608.

A very typical colony.—M. L. FERNALD.

SOME ADDITIONS TO THE OKLAHOMA FLORA

U. T. WATERFALL

DURING the summer of 1948 the author continued his research on the flora and vegetation of Oklahoma as Botanist with the Oklahoma Biological Survey, following a general plan previously outlined.[1] Collections were made from areas situated in all parts of the state. Particular attention was given to those showing evidence of unique floral relationships as compared with the flora of the principal parts of the state.

One such area is to be found in southwestern Oklahoma, especially in Harmon and Jackson Counties. Much of the land is in cultivation, wheat being the principal crop at the present time. Other parts are too rough or have a soil too shallow and poorly developed for agriculture. Much of the latter land is used for pasture, and is frequently characterized by *Buchloe dactyloides* with a sparse to a rather dense stand of *Prosopis juliflora* var. *glandulosa*. Other characteristic grasses on such sites are *Boutelous rigidiseta*, *B. gracilis*, *Aristida purpurea*, *Muhlenbergia Torreyi*, *Triodia pilosa* and *Schedonnardus paniculatus*. *Hordeum pusillum* is frequently abundant in the spring.

On saline sites the principal grasses found are *Sporobolus airoides* and *Distichlis stricta*. Occasionally *Sporobolus texana* is abundant.

On sandy soils *Andropogon scoparius* becomes the dominant species when not overgrazed. *Andropogon Hallii* is often abundant, and *Artemisia filifolia* is more or less common, its abundance depending primarily on the grazing pressure.

In the southwestern part of Harmon County *Condalia obtusifolia* becomes a characteristic shrub found scattered on grassland, and fairly abundant on ridges and "breaks" along the Red River and its tributaries. Here also are found *Rhus microphylla*,

[1] Waterfall, U. T., *Some Results of a Summer's Botanizing in Oklahoma*. RHODORA 51: 18–21, 1949.

Opuntia leptocaulis, *Cassia Roemeriana*, *Setaria macrostachya*, *Nicotiana trigonophylla* and *Cevallia sinuata*.

A list of some of the species of southwestern affinities collected in this general area includes *Juniperus Pinchoti*, *Bouteloua barbata*, *B. rigidiseta*, *Hilaria mutica*, *Setaria macrostachya*, *Sueada suffrutescens*, *Abronia fragrans*, *Clematis Drummondii*, *Cassia Roemeriana*, *Erodium texanum*, *Euphorbia albomarginata*, *E. lata*, *Reverchonia arenaria*, *Rhus microphylla*, *Condalia obtusifolia*, *Sida physocalyx*, *Cevallia sinuata*, *Echinocactus texensis*, *Opuntia leptocaulis*, *Limonium limbatum*, *Sarcostemma crispa*, *S. cynanchoides*, *Cressa truxillensis*, *Verbena plicata*, *Lycium Barlandieri*, *Nicotiana trigonophylla*, *Plantago Wrightiana*, *Houstonia humifusa*, *Ibervillea Lindheimeri*, *Aphanostephus ramosissimus*, *Gaillardia pinnatifida*, *Haploesthes Greggii* var. *texana* and *Helenium microcephalum*.

There follows an enumeration of plants new to Oklahoma or otherwise noteworthy. Those that the author believes to be hitherto unreported from the state are prefixed with an asterisk. There are thirty-five such entities recorded.

ENUMERATION OF SPECIES

*AEGILOPS CYLINDRICA Host., var. RUBIGINOSA Popova. The pubescent variety was collected as *Waterfall* 7786, overgrazed pasture, 3 miles south of Gould, Harmon County, June 5, 1948. In our herbarium we also have referrable to this variety *Charles Smith* 2073, Beckham County, June 11, 1940.

*AGROSTIS VERTICILLATA Vill. was collected as *Waterfall* 7919, sand, bed of the Cimarron River, 4 miles north and 1 mile west of Kenton, Cimarron County, June 14, 1948. It was quite abundant there.

Hitchcock[1] says it is found from "Texas to California, north to southern Utah and Washington". His distribution map shows that it has been collected in New Mexico. Featherly[2] does not list it from Oklahoma.

*BOUTELONA BARBATA Lag. was collected as *Waterfall* 8729, shallow silty clay on gypsum, 6 miles south of Hollis, Harmon County, August 26, 1948.

[1] **Hitchcock, A. S.**, *Manual of the Grasses of the United States*. 329–330. 1935.
[2] **Featherly, H. I.**, *Manual of the Grasses of Oklahoma*. 1946.

Featherly (op. cit.) does not list this species from Oklahoma. Hitchcock[1] includes the adjoining states of Texas and New Mexico in its range.

ERIANTHUS ALOPECUROIDES (L.) DC. Featherly (op. cit.) cites this species from Oklahoma. As the basis for its inclusion, he says: "Specimen (727529) in the U. S. National Herbarium . . . Indian Territory. The collector's name is not on the label, nor is the date. The place on the form label for date is made 188–, which shows that it was probably collected sometimes in the eighties."

Referred to this species is *Waterfall* 8532, rocky slopes of Kiamichi Mountains, 1 mile north and ½ mile west of Honobia, Pushmataha County, August 9, 1948. Thus, after 60 years, is made a confirmatory collection of the above somewhat dubious record.

*GLYCERIA ARKANSANA Fernald. A species of *Glyceria* apparently referrable to *G. arkansana* was collected as *Waterfall* 8070, in swamp at edge of pond, 8 miles west of Tom, McCurtain County, June 23, 1948.

Fernald[2] in describing the species cites material from Arkansas and Louisiana. Hitchcock[3] adds "Texas (fide Fernald)". This is another element of the flora which is southeastern in its affinities.

*MUHLENBERGIA PORTERI Scribn. was collected as *Waterfall* 8669, blue and red shale along West Carrizo Creek, 3 miles north and ½ mile west of Kenton, Cimarron County, August 23, 1948, and as *Waterfall* 8693, sandstone buttes (with *Pinus cembroides* var. *edulis*, *Pinus ponderosa*, *Juniperus monosperma* and *Quercus* spp. south of Tesequite Creek, 1 mile west and 4 south of Kenton, Cimarron County, August 24, 1948.

The species is not listed by Featherly (op. cit.). Hitchcock[4] says it occurs from "western Texas to Colorado, Nevada and southern California, south to northern Mexico".

*ORYZOPSIS HYMENOIDES (Roem. & Schult.) Ricker. This species was collected as *Waterfall* 7910, sand around white sandstone, north of the Black Mesa, 3 miles north and ½ west of Kenton, Cimarron County, June 13, 1948.

[1] Hitchcock, A. S., *op. cit.* 517.
[2] Fernald, M. L. *Four Grasses of Eastern America.* RHODORA 31: 49. 1929.
[3] Hitchcock, A. S., *op. cit.*
[4] Hitchcock, A. S., *op. cit.* 381. 1935.

Hitchcock (*op. cit.*) shows the species occurring in the adjacent states of Kansas, Colorado, New Mexico, and Texas, but not in Oklahoma.

SPOROBOLUS POIRETII (Roem. and Schult.) Hitchc. This species was collected as *Waterfall* 8045, sand, edge of oak-pine woods, 1 mile west of Tom, McCurtain County, June 23, 1948.

Hitchcock (op. cit.) gives Arkansas and Texas as constituting its western limit of range. Featherly (*op. cit.*) states that it has been collected in Pittsburg County. Possibly it will be found in the intervening area.

*CYPERUS COMPRESSUES L. Referred to this species is *Waterfall* 8477, collected in flower beds, Cavender Tourist Courts, Idabel, McCurtain County, August 8, 1948.

Small[1] states that this species occurs "in fields, Maryland to Florida, Missouri and Texas." Cory[2] lists it only from the Coastal Prairies.

*CYPERUS FLAVESCENS L., var. POAEFORMIS (Pursh.) Fern. So referred is *Waterfall* 8059, ditch east of Tom, McCurtain County, June 23, 1948.

Neither Jeffs and Little[3] nor Stevens[4] list the species from the state. Fernald[5] says that var. *poaeformis* extends from the West Indies and Florida to Texas, northward to southeastern New York, Pennsylvania, Ohio, Michigan, Illinois and Missouri.

*RHYNCHOSPORA CORNICULATA (Lam.) Gray, var. **typica** nom. nov. (*Schoenus corniculatus* Lam. Tabl. Encycl. **1**: 137. 1791). Referred to var. *typica* is a collection having achenes about twice as wide as the bases of the tubercles. According to Fernald[6] this is a distinguishing characteristic of typical *R. corniculata*. The collection is *Waterfall* 8528, slew 3 miles east of Albion, Pushmataha County, August 9, 1948. Also referred to var. *typica* is *Waterfall* 8106, 2 miles southeast of Talihina, LeFlore County, June 24, 1948.

[1] Small, J. K., *Flora of the Southeastern United States*. 1913.

[2] Cory, V. L., *Catalogue of the Flora of Texas*. 26. 1938.

[3] Jeffs, R. E. and Elbert L. Little. *A Preliminary Checklist of the Ferns and Seed Plants of Oklahoma*. 1930.

[4] Stevens, G. L. *The Flora of Oklahoma*. Unpublished MSS. Original deposited in the Widener Library of Harvard University. 1916.

[5] Fernald, M. L. *Last Survivors in the Flora of Tidewater Virginia*. RHODORA **41**: 529–530. 1939.

[6] Fernald, M. L., *Some Allies of Rhynchospora macrostachya*. RHODORA **20**: 138–140. 1918.

*Rhynchospora corniculata (Lam.) Gray, var. interior Fern. So referred are plants collected as *Waterfall* 8449. The perianth bristles are shorter than the achenes, which have their distal ends little wider than the bases of the tubercles as described by Fernald (op. cit.). The collection was taken from a swamp at the edge of Big Grassy Lake, 4 miles west and 4 south of Tom, McCurtain County, August 7, 1948. In our herbarium we also have *Milton Hopkins and Van Valkenburgh* 6127, deep rich swampy woods of maple, gum, and water oak near cypress swamps, 5 miles east and 4 south of Broken Bow, McCurtain County, October 12, 1941.

*Rhynchospora glomerata (L.) Vahl., var. angusta Gale. We have one collection of *R. glomerata* which is referred to var. *angusta* because it has a more slender and accentuated gynophore than our other representatives of this species. It is *Waterfall* 8549, ditch 8 miles west and 1½ south of Talihina, Latimer County, August 9, 1948.

Gale[1] cites material from Arkansas, Louisiana, and Texas.

*Rhynchospora globularis (Chapm.) Small, var. recognita Gale (*R. cymosa* of authors).

Gale[2] gives a range-statement that includes "scattered in eastern Texas (and) Louisiana." Jeffs and Little[3] list this species (as *R. cymosa*) but the only material so named in our herbarium, *Little*, sin num., Muskogee County, July 4, 1929, is not that species, but is *R. Harveyi*. This sheet is probably the basis for the previous report of *R. cymosa*.

Scirpus californicus (C. A. Meyer) Steudel was collected as *Waterfall* 8029 and 8446, both from the swamp at the edge of Big. Grassy Lake, 4 miles west and 4 south of Tom, McCurtain County.

The only other reference I find to this species from Oklahoma is in Beetle's Monograph[4] where he cites *J. deGruchy* 130 collected near Tahlequah.

*Scleria oligantha Michx. was collected as *Waterfall* 8061, in woods 3½ miles south and 2 miles east of Tom, McCurtain County, June 23, 1948.

[1] Gale, Shirley. *Rhynchospora Section Eurhynchospora in Canada, the United States and the West Indies.* Rhodora **46**: 245–246. 1944.

[2] Gale, Shirley. *Rhynchospora, Section Eurhynchospora in Canada, the United States and the West Indies.* Rhodora **46**: 245–246. 1944.

[3] Jeffs, R. E. and Elbert L. Little, *A preliminary List of the Ferns and Seed Plants of Oklahoma.* Publ., U. of Okla. Biol. Survey. **2** (2): 1930.

[4] Beetle, Alan A., *Studies in the Genus Scirpus L. III.* Am. Jour. Bot. **28**: 698–699. 1941.

Core[1] cites collections from the adjacent states of Arkansas and Texas. The author's 8061 represents an eastern extension into Oklahoma.

SCLERIA TRIGLOMERATA Michx. sensu Fern.[2, 3] non sensu Core. In our herbarium we have the following sheets of this species: *E. Little* 2572, Muskogee County, August 28, 1927; *O. M. Clark* sin num, Laura, Latimer County, June 16, 1930.

*JUNCUS BUFONIUS L. was collected as *Waterfall* 8052, in ditch east of Tom, McCurtain County, June 23, 1948.

This small annual *Juncus* is not listed by Jeffs and Little (*op. cit.*). Stevens (op. cit.) includes the species, but only says it "should be expected." The above cited collection realizes his expectation.

*QUERCUS GAMBELII Nutt. Referred to this species are: *Waterfall* 8700 and 8701, canyon between hills, 5 miles south and 1 west of Kenton, Cimarron Counties, August 24, 1948, and *Waterfall* 7951, same locality, June 14, 1948.

*SILENE STELLATA (L.) Ait. f. var. SCABRELLA (Nieuwl.) Palm. and Steyerm. In our herbarium we have 2 sheets of the typical, glabrous variety. The other 15 sheets are of var. *scabrella*.

CLEMATIS DRUMMONDII T. & G. was taken as *Waterfall* 8715 (pistillate) and 8732 (staminate), 4 miles south of Hollis, Harmon County, August 26, 1948.

Stevens (*op. cit.*) has previously reported it from the "southwestern part of the State." The species is little collected in Oklahoma. We have no other material in our herbarium, and it is not listed by Jeffs and Little or by Stemen and Myers.

(*To be continued*)

[1] Core, Earl L. *The American Species of Scleria.* Brittonia 2: 75–76. 1936.
[2] Fernald, M. L., *Plants from the Outer Costal Plain of Virginia.* RHODORA 38: 398. 1936.
[3] Fernald, M. L., *Another Century of Additions to the Flora of Virginia.* RHODORA 43: 539–541. 1941.

Volume 51, no. 612, including pages 369–410 and title-page of volume, was issued 9 December, 1949.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. February, 1950. No. 614.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—**A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.**

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Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
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TYPE of BETULA MICHAUXII Spach (*B. nana* sensu Michaux, not L.). Michaux's writing at right, Spach's at left.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. February, 1950 No. 614

BETULA MICHAUXII, A BRIEF SYMPOSIUM

1. INTRODUCTORY NOTE

M. L. Fernald

In his Flora Boreali-Americana, ii. 180, 181 (1803) André Michaux enumerated under true *Betula* five species: *B. nana* L., *B. glandulosa* Michx., *B. papyrifera* Michx. (with *B. papyracea* Ait. cited as a synonym), *B. lanulosa* Michx. [= *B. nigra* L.] and *B. carpinifolia* Michx. [= *B. lenta* L.]. All four of Michaux's own species had full and clearly stated descriptions and, quite naturally, it would be assumed that his diagnosis of *B. nana* was based on his own material so named:

NANA L. B. humillima, glaberrima: foliis perpusillis, subcuneato-orbiculatis, inciso-crenulatis, reticulato-venosis: amenti squamis profunde 3-partitis, laciniis oblongis: capsulis orbiculatis, subapteris.
Hab. in sphagnosis, a sinu *Hudsonis* ad lacus *Mistassins*.

Spach, citing the sheet in the Michaux Herbarium at Paris and Newfoundland material also there as the bases of a new species, *Betula Michauxii* Spach in Ann. Sci. Nat. sér. 2, xv. 195 (1841), emphasized the "ramis . . . novellis tomentosis" ["glaberrima"—Michx.], "foliis . . . cuneato-flabelliformibus" ["subcuneato-orbiculatis"—Michx.] and "Strobilis . . . squamis ovato– v. oblongo-lanceolatis" ["profunde 3-partitis"—Michx.]

Until recently I did not realize that Michaux was not describing his own material but was giving a compiled or copied diagnosis of the European *Betula nana* L. Across the southern half of the Labrador Peninsula, from north of the Straits of Belle Isle to the region of Hudson Bay, dwarf and depressed states of

both *B. glandulosa* (with glabrous branchlets, subrotund leaves and 3-lobed bracts) and of *B. pumila* L. (unnoted by Michaux) occur, and since nothing matching the characteristic Newfoundland shrub had been reported from west of the Côte Nord of Quebec, I assumed that the shrub from between Hudson Bay and Lake Mistassini must be one which fitted Michaux's description. Consequently, in RHODORA, xlvii. 326, t. 975, figs. 1–4 (1945), reasoning that the name *B. Michauxii* must be retained for the Michaux element (whatever that might prove to be) with glabrous branchlets, suborbicular leaves and deeply 3-lobed bracts (although Spach had not given these characters)—consequently, I named the characteristic Newfoundland shrub with densely pubescent branchlets, cuneate-flabelliform leaves and unlobed bracts and plump and wingless nutlets, *Betula terrae-novae* Fern.

Now, however, Professor Jacques Rousseau, exploring in Ungava, has recently found characteristic *Betula terrae-novae* in bogs along George River, thus proving that this distinct shrub actually occurs in the general region assigned by Michaux for *B. nana.* Then, securing a photograph of the Michaux sheet (their PLATE 1156) at Paris, he and his associate, Marcel Raymond, have presented (as Part 2, following) a carefully reasoned discussion, demonstrating that Michaux did not give a description of his own material but, assuming that he had the European *B. nana*, had contented himself by the easy copying or compiling of a European account of the latter species.

Since the photograph of the Michaux sheet, the TYPE of *Betula Michauxii*, did not show with absolute conclusiveness the simplicity of possible lobation of the bracts nor any of the plump and wingless samaras, it seemed to me wise to have the matter settled beyond any possible doubt. Therefore, I took advantage of the helpfulness of my always friendly correspondent, M. Pierre Senay, who had looked into other problems for me at the Herbarium of the Muséum National d'Histoire Naturelle in Paris. He and M. Paul Jovet of the Muséum made a close study of the type and M. Jovet made a sketch (their FIG. 1) of a portion of a fruiting ament under a binocular. The main portion of M. Jovet's drawing and of M. Senay's accompanying letter are included as part 3 in this brief but significant series of articles.

They clearly demonstrate that the conclusions of Rousseau and Raymond are fully justified and that the name *B. terrae-novae* is superfluous. It also becomes evident that caution must be exercised in ascribing to Michaux (or his editor, Richard) originality in all descriptions published in Michaux's great work. Incidentally and most embarrassingly, it must be recorded that, at this late date (after a lapse of nearly half-a-century) I find, on looking up the memoranda made by me when studying Michaux's Herbarium in 1903, I then made the soon forgotten note regarding his full sheet of branchlets of *Betula nana:* "= *Michauxii*, Spach! splendid specimens with constant characters".

2. BETULA MICHAUXII SPACH IN NORTHEASTERN AMERICA

Jacques Rousseau and Marcel Raymond

(Plate 1156)

A dwarf birch, collected by André Michaux somewhere along the Rupert River or one of its branches: "Hab. a sinu Huds. ad lacus Mistassinos in sphagnosis", is described in *Flora boreali-americana.* (1). Michaux believed the shrub to be the arctic *Betula nana* L. A superficial examination of the two shows a close resemblance. However, the fruiting scales in one differ markedly from those in the other: entire or nearly so in Michaux' plant, they are trilobate in true *B. nana* L.

Later on Spach (2), having both Michaux' and probably La Pylaie's specimens on hand, described the plant as a new species under the name *B. Michauxii* and placed it in his new section Apterocaryon.

In 1945 (3), Professor Fernald rejected Spach's name and redescribed the small birch of Newfoundland and adjacent Labrador, excluding Michaux' plant, which he had not seen at the moment. He called it *Betula terrae-novae,* on the assumption that *Betula Michauxii* Spach "had so confused a start". The confusion stemmed from two facts: the description which appears in *Flora boreali-americana* was not based completely upon the Michaux-plant, but partly on some European or Asiatic collection or description. In fact, there is in Michaux' herbarium a specimen of true *B. nana* L. with the indication: "Hortus Tri-

anonensis. Seminib. e Siberia missis Richard." Consequently the "amenti squamis" are given as "profunde 3 partitis". The phrasing differs in no way from the classical description of the arctic *B. nana* L., which one finds repeated, with only slight variations, from one author to another: MICHAUX, WILLDENOW, PURSH, etc. The second reason FERNALD gives is that in SPACH's description, the "strobili" are described as "4–9 pollices longi", instead of "4–8 lineas longi".

A look at the reproduction of MICHAUX' specimen (Plate 1156) leaves little doubt as to its identity, which has long since been accepted by REGEL (4), WINKLER (5), among others. The size of the strobiles in the MICHAUX plant differ little if any from that of the Newfoundland plant considered as the type of *Betula terrae-novae*. SPACH, a keen student of trees, doubtless had in mind MICHAUX' specimen. He mentions not only that his new species is "Betula nana Michx! Flo. Bor. Amer. exclus. syn." but affirms that he saw the specimen in the herbarium of the Muséum d'Histoire Naturelle in Paris. It is quite fitting, since the specimen collected by MICHAUX served as type in the description of his new species, that SPACH should choose the name of its collector as the specific epithet.

The description reads as follows:

Sectio II. APTEROCARYON Nob.

Nuculae apterae, margine incrassato, intus suberoso, cinctae.—Squamae strobileae semper 1-carpae, integerrimae, nuculis duplo angustiores (ideoque illas per maturationem haud obtegentes).

B. MICHAUXII Nob.—*Betula nana* Michx.! Flor. Bor. Amer. (exclus. syn.)—Fruticosa; ramis divaricatis v. diffusis: novellis tomentosis, impunctatis. Foliis subcoriaceis, reticulatis, glabris, impunctatis, subsessilibus, cuneato-flabelliformibus, inciso-serratis, v. crenato-dentatis, basin versus integerrimis. Strobilis sessilibus, cylindraceis, gracilibus, foliis longioribus; squamis ovato– v. oblongo-lanceolatis, v. oblongis, obtusis, v. acutis, v. acuminatis, apice laxis v. subsquarrosis. Nuculis ovatis v. subrotundis.—America borealis et insula Terrae Novae. (V. s. sp. in Herb. Mus. Par.)

Frutex humilis, ramosissimus, habitû et foliis *Betulae nanae* similis. Folia 3–6 lineas longa, lucida, petiolo tenui, brevissimo. Strobili 4–8 pollices (SIC!) longi, squamis nuculis paulò longioribus.

In addition to the very characteristic fruiting scales, the shape of the leaves is also striking: "cuneato-flabelliformibus" stated SPACH; "late cuneato-flabelliformibus" writes FERNALD. It

could be added that *Betula nana* L. β. *flabellifolia* Hooker (in *Flora boreali-americana* II. 157. 1838) probably belongs here, and would be the oldest varietal name.

Spach or the typographer made the lapsus calami "4–8 pollices longi". The diagnosis should read "4–8 lineas longi". Otherwise, in the description, it is quite obvious that Spach would have not only stated "strobilis sessilibus, cylindraceis, gracilibus, foliis longioribus", but "multo longioribus", since a dwarf plant with strobiles 4–8 inches long would be striking enough to catch any taxonomist's attention!

As Spach clearly had Michaux' plant in mind (the specimen bears his personal annotation); as the mention "4–8 pollices longi" is doubtless a typographical error; as unintentional typographical errors are not sufficient grounds to reject the name of a plant; as otherwise there is no doubt about Spach's description, and that, furthermore, study of the Michaux' specimen confirms the aforementioned views, Spach's name must be restored as the valid name, and *B. terrae-novae* placed amongst its synonyms. Moreover Michaux' specimen must be considered the type.

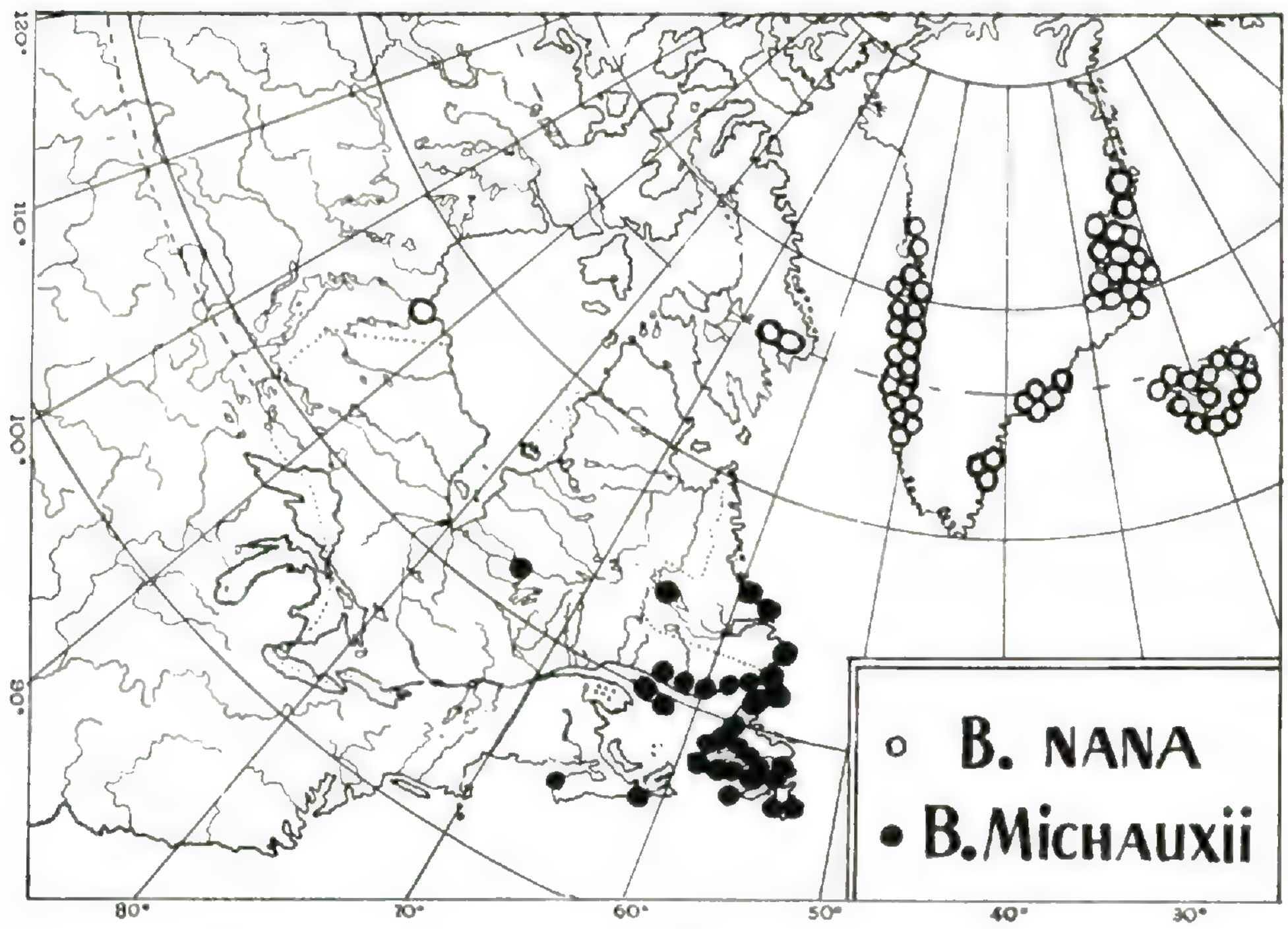
Winkler (loc. cit.: 70) gives a good description and an accurate illustration of *Betula Michauxii*, based on Michaux' plant and also on a specimen collected in Newfoundland, probably by La Pylaie. He writes: "Vidi specimen alterum in herb. musei bot. berolinensis a cl. A. Richard datum cum nota" "America septentrionalis Michaux", alterum in herb. Boiss. in Terra nova collectum. B. nana Michx. Fl. bor. Amer. II (1803) 180 non huc trahenda".

As early as 1902, Professor Fernald (6) clearly understood *B. nana* var. *Michauxii*, which, in 1861, Regel first lowered to the rank of a variety of *B. nana*, but later, in 1868, restored to its rank of species.

The senior author spent four summers botanizing in the Lake Mistassini area but, after careful search, is still unable to report finding *B. Michauxii* there. However, the birch was not collected in the immediate environs of Lake Mistassini, according to the label Michaux himself wrote (compare the calligraphy with that in the manuscript of his diary), but rather in the region between Lake Mistassini and Hudson Bay. In an attempt to

reach James bay, MICHAUX travelled westward to a distance of about 78 miles from Lake Mistassini before giving up because of the lateness of the season (7).

The occurrence of *B. Michauxii* at this latitude in the interior is hardly out of the ordinary, since the senior author of this note collected it in Eastern Ungava, on Hubbard Lake, at the head of George River, at 54° 46′ Lat. N., where it grows abundantly in peat-bogs. Among other new localities in Québec, we may also



MAP 1. Map of BETULA MICHAUXII Spach drawn from specimens deposited in the MARIE-VICTORIN Herbarium, from literature and from a complementary sketch provided by Prof. FERNALD.—Distribution of *B. nana* in Northeastern North America from literature, mainly BÖCHER (loc. cit.).

include Anticosti Island (*Rousseau*), where the shrub is common in the peat-bogs which cover the center of the island. Apparently, it has never been reported from stations along the coastline.

Compiled from herbaria and literature, below is a list of the collections of *Betula Michauxii* Spach known to us. Map 1 shows, in addition to these cited stations, others which are represented in the Gray Herbarium, the dots taken from a sketch-map supplied by Professor Fernald.

LABRADOR: Blanc Sablon, *Fernald & Wiegand* 3269 (8).

QUEBEC: Between Hudson Bay and Lake Mistassini, *Michaux* (1792).—Along George River (Hubbard Lake), in Eastern Ungava, *Rousseau* 36.—North Shore of the St-Lawrence: Natashkwan River, *C. W. Townsend*.—Lagorgendière: Romaine, *St. John 90 386*.—Kegaska, *Lewis*.—Harrington Harbour, *Lewis* (9).—Pointe-aux-Esquimaux: au bord des étangs de la tundra derrière le village, 11 juillet 1924, *Marie-Victorin & Rolland-Germain 18 876*.—Anticosti: au centre de l'île, entre le 10e mille de la Rivière au Saumon et la source du Crique à la Chaloupe; dans une tourbière, 13 juillet 1942. *Jacques Rousseau 52 263*.—Entre la source de la Rivière Vauréal et la source de la Rivière au Saumon, au centre de l'île. Dans une tourbière, 10 juillet 1942, *Jacques Rousseau, 52 172*.

NOVA SCOTIA: Liscomb River, Gusboro Co., *E. R. Faribault* (1884). New to the flora of Nova Scotia. FARIBAULT, a geologist, still living, has extensively surveyed gold-bearing series in Nova Scotia. He made some botanical collections which are included now in the MARIE-VICTORIN Herbarium. [The dot indicated for extreme western Nova Scotia indicates its occurrence in bays of Brier Island, Digby County, where it was recently discovered by Dr. Roland.—M. L. F.]

NEWFOUNDLAND: numerous collections by *La Pylaie, Waghorne, Fernald & Wiegand, K. P. Jansson*, at Cape Ray, Burgeo, Long Range, Goose Pond.

SAINT PIERRE ET MIQUELON: Arsène (10).

Betula Michauxii is indeed very close to *Betula nana*. Recently (11), Professor Eric HULTÉN described *Betula nana* L. ssp. *exilis* (Sukatch.) Hultén var. *reducta* Hultén, from Alaska, which shows "peculiarly reduced catkin-scales corresponding to those of *B. Michauxii* (*B. nana* var. *Michauxii*) of the Lower St. Lawrence R. distr., Newfoundland and Labrador".

Betula nana has not as yet been reported from Quebec. Consult the map in HEGI (12). But since it occurs in Eastern and Western Greenland (13), and as Dr. N. POLUNIN (14) made a collection in Central Baffin (see our own map), it may probably turn up some day in Ungava and then fill the distributional gap between Baffin and Western Alaska.

The authors wish to thank cordially Mr. James KUCYNIAK for his help in the drafting of this article.

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(11) HULTÉN, ERIC. *Flora of Alaska and Yukon IV:* 572–585. Lund. 1944.
(12) HEGI, GUSTAV. *Illustrierte Flora von Mittel-Europa III:* 84. Fig. 481.
(13) BÖCHER, TYGE W. *Biological distributional types in the flora of Greenland.* Medd. om Grønland Bd. 106 (Nr. 2): 68–71. Fig. 31. 1938.
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MONTREAL BOTANICAL GARDEN

3. THE TYPE OF BETULA MICHAUXII

PIERRE SENAY AND PAUL JOVET

[The text is taken from a letter of M. Senay, dated August 28, 1949. The figure is from drawings (enlarged) by M. Jovet.—EDS.]

Dear Mr. Fernald.

From the result of my examination of the type specimen of *Betula Michauxii* Spach, "*B. nana* L." of Michaux, you will undoubtedly see that the investigation was most useful indeed.

(1) PUBESCENCE:—From the top downwards the branchlets are covered with very short indumentum (nearly felt-like), dense about the tip; then the density decreases and, in the portion between five and ten centimeters below the apex, the branchlets begin to become more or less pubescent, then glabrescent and are completely glabrous below 10 cm. or so.

No glands (particles of dust should not be mistaken for such).

The color of the hairs follows the same pattern; the top ones are russet-gray, and the lower ones grayish-white, and, in the portion between 5 and 10 cm., there is a mixture of both. There is no sharp line of demarcation regarding either the density or the color of the hairs, the differentiation is progressive from the top downward.

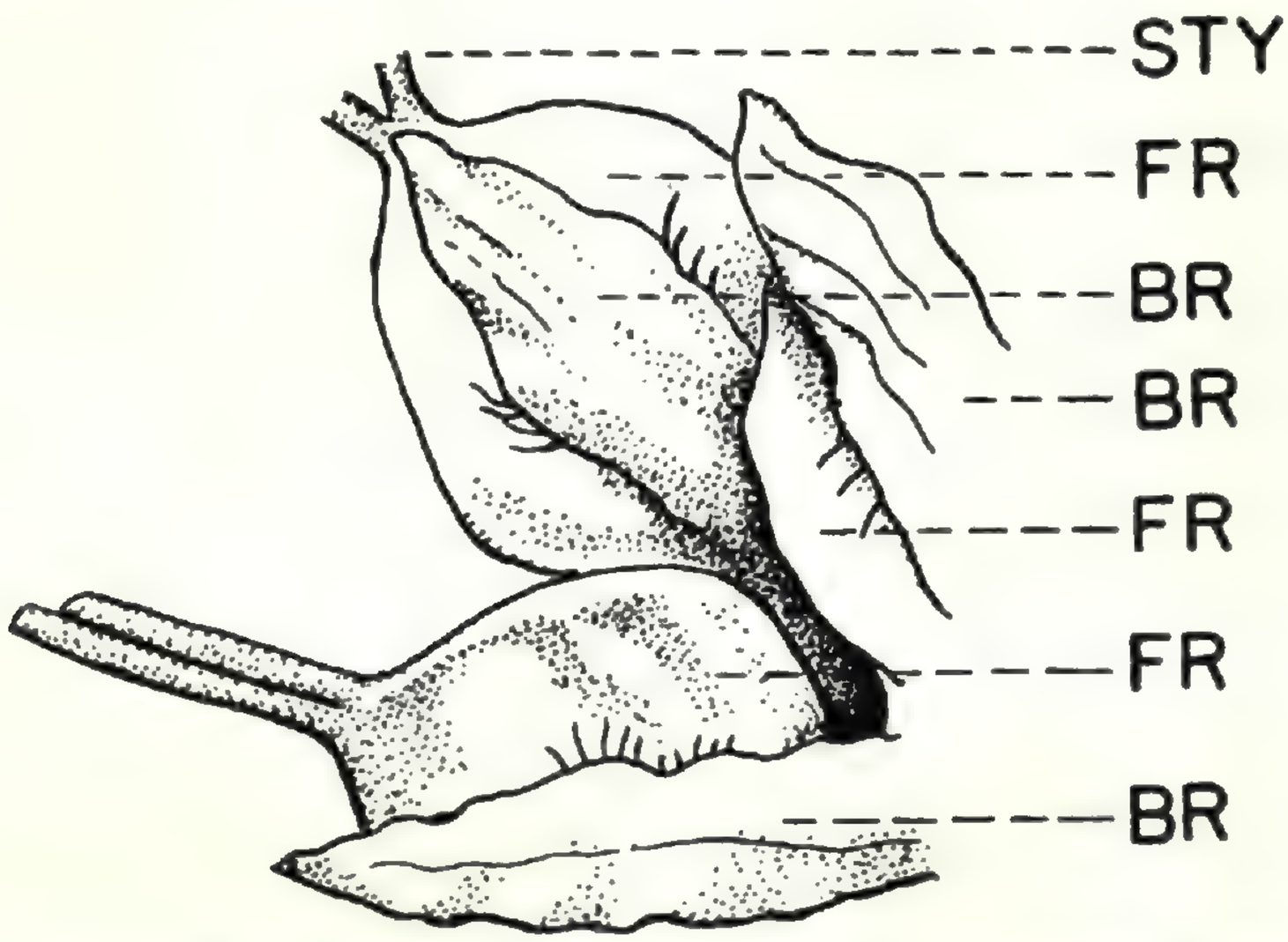

FIG. 1. Enlarged Bracts and Fruits of BETULA MICHAUXII (after *Jovet*).

A very young ament is covered with silvery-grayish-white hairs reaching 0.5–0.6 mm.

Last but not least:

(2) SQUAMAE:—At first glance, without lens, they really look 3-lobed and no better comparison may be made than with minute *Polygala*-like fruits in which the fruit exceeds both sides of the "wing". And this certainly led Michaux into error.

Actually, the squamae are entire and, under the lens, slightly ciliolate on the margins. There cannot be any hesitation on this point. So those of your botanists who have seen them unlobed are quite right.

The specimens were examined conjointly by Jovet, who made the drawings (FIG. 1) "in sicco", and myself.

ASNIÈRES (SEINE)

A Note on the Varieties of Zizania aquatica L.—In September, 1949, a number of specimens of wild rice were collected along the St. John River at Fredericton in York County, and at Hamstead in Queens County, New Brunswick. It was at once evident that many of the plants in these stands exceeded the stature of *Zizania aquatica* L. var. *angustifolia* Hitchcock, supposedly the only variety occurring in New Brunswick[1]. Plants ranging from less than 1 m. in height up to 2.5 m. were noted, whereas the maximum for the var. *angustifolia* as described by Fassett is 1.5 m. Moreover, it appeared that the size was correlated with the ecological conditions, smaller plants occurring on the more sandy mud.

The specimens collected were determined with the aid of N. C. Fassett's key and specimens in the Gray Herbarium and the Herbarium of the New England Botanical Club. Some of the material could be referred to the var. *angustifolia;* much of it fell under *Z. aquatica* var. *interior* Fassett; and some of it was intermediate, possessing some characters of each. In addition to stature, the characters used in determination were the purely quantitative ones of ligule-length, leaf-width, and the number of staminate and pistillate spikelets per branch. Specimens referable to both varieties, as well as intermediate forms, occurred in the same stand, growing close together, the differences seemingly correlated with local conditions. It is interesting to note that in the areas visited material which would fit the var. *angustifolia* completely was in the minority.

From these observations we feel that one of two possible conclusions should be drawn. Either the var. *interior* extends much farther eastward than the range originally ascribed to it by Fassett, or the two varieties *angustifolia* and *interior* are not distinct in New Brunswick.—Taylor A. Steeves, The Biological Laboratories, Harvard University, and Gordon P. DeWolf, Jr., Chelmsford, Mass.

[1] Fassett, N. C., A Study of the Genus Zizania, Rhodora **26**: 153–160, 1924.

SOME ADDITIONS TO THE OKLAHOMA FLORA

U. T. Waterfall

(*Continued from page 24*)

Itea virginica L. was collected as *Waterfall* 8496, edges of *Taxodium* swamps, 9 miles east and 2 south of Broken Bow, McCurtain County, August 8, 1948. We have in our herbarium only one previous collection from the state, *Stevens* 2652, near Page, Leflore County, September 7, 1913.

*Desmodium rotundifolium (Michx.) DC. Referred to this species is *Waterfall* 8221, steep wooded banks 3 miles west of state line (west of Siloam Springs) and 2½ miles north, Delaware County, July 8, 1948.

Although the plant is just beginning to flower, the characteristic leaf shape, and the large, ovate, striate, attenuate stipules seem to make the determination fairly safe.

*Erodium texanum Gray was collected as *Waterfall* 8722, shallow silty clay on gypsum, 6 miles south of Hollis, Harmon County, August 26, 1948. *Waterfall* 8362, top of mesa, 6 miles east and 1½ north of Eldorado, Jackson County, July 23, 1948; *Waterfall* 8354, shallow silty soil on gypsum 5 miles north and 2 west of Eldorado, Jackson County, July 23, 1948.

This species is not listed by Stemen and Myers (*op. cit.*), Jeffs and Little (*op. cit.*), or Stevens (*op. cit.*). Small[1] states that the distribution is from "Texas to middle California and lower California." The cited specimens constitute a northward extension of range into Oklahoma.

*Parthenocissus quinquefolia (L.) Planch, forma hirsuta (Donn.) Fernald. In our herbarium we have several sheets of the pubescent form taken from scattered localities.

*Passiflora incarnata L., forma **alba** f. nov., corollis lobae et coronis albis. The type is *Waterfall* 8198, two miles east of Choteau, Mayes County, July 7, 1948. It is in the Bebb Herbarium of the University of Oklahoma.

Although the author knows of the white flowered form only from this area, he is describing it as a forma rather than a variety, since its range is not known to exceed that of the typical form, and since it is only a minor variant.

[1] Small, J. K. and Linda Tracy Hawks. *Geraniaceae*, N. Am. Fl. **25** (1): 22. 1907.

CYNOSCIADUM DIGITATUM DC. was collected as *Waterfall* 8049, swamps 3½ miles south and 2 east of Tom, McCurtain County, June 23, 1948.

Although listed by Jeffs and Little (*op. cit.*) and Stevens (*op. cit.*) we have no confirming specimens in our herbarium. Mathias and Constance[1] state that the species is distributed from "southern Missouri to eastern Texas", which range could easily include the extreme southeastern part of our state where the above cited number was taken.

*LIMONIUM LIMBATUM Small. Referred to this species is *Waterfall* 8319, valley of the Red River, 3 miles west and 7 south of Hollis, Harmon County, July 21, 1948.

This is the only representative of the *Plumbaginaceae* known from Oklahoma.

*CYNOCTONUM MITREOLA (L.) Britton. So referred is *Waterfall* 8508, growing in pond, 6 miles north of Broken Bow, McCurtain County, August 9, 1948.

The genus is not recorded from our state in current manuals and check lists. In Gray's Manual[2], the range of *C. Mitreola* is stated to be "Virginia to Texas." Cory's statement of range (*op. cit.*) includes his area 1, the "Timber Belt", which is adjacent to the part of Oklahoma from which the above collection was made.

NYMPHOIDES PELTATUM (Gmel.) Kuntze was taken as *Waterfall* 8503, growing in pond, 6 miles north of Broken Bow, McCurtain County, August 9, 1948. Growing with it was *Cynoctonum Mitreola*.

Stratton[3] has previously reported *N. peltatum* (without specimen citation) from Bryan County, Oklahoma.

*ASCLEPIAS LONGICORNU Benth was collected as *Waterfall* 8592, growing in silty clay (with *Euphorbia albomarginata*, *Panicum texanum*, *Physalis lobata* and *Ditaxis humilis*) 2 miles south of Okeene, Blaine County, August 20, 1948 and *Waterfall*

[1] Mathias, Mildred E. and Lincolm Constance. *Umbelliferae*. N. Am. Fl. **28B** (2): 164. 1945.

[2] Robinson, B. L. and M. L. Fernald. *Gray's New Manual of Botany*. Ed. 7. 1908.

[3] Stratton, Robert. *Some Oklahoma Vascular Plants*. Proc. Okla. Acad. Sci. **28**: 62–65, 1948.

8606, growing in silty clay (with *Euphorbia albomarginata*) 10 miles west of Orienta, Major County, August 20, 1948.

These collections represent considerable northward extensions of range from areas where it has been known previously. Small[1] says "Texas to New Mexico and Mexico." Cory[2] states that it occurs in areas 2, 4, 5, and 6, i. e., coastal, central, and southwestern Texas. The species should be found between the areas listed by Cory and the region of my present collections.

*Convolvulus hermannioides Gray. So referred is *Waterfall* 7783 collected on a dolomite knoll, 3 miles north of Duke, Jackson County, June 4, 1948.

The auricled sepals are about a centimeter long. Associates include *Aphanostephus ramosissimus* (not *A. pilosus*) and *Gaillardia pinnatifida*. *C. hermannioides* has been known previously from Texas.

*Cressa truxillensis HBK. was collected as *Waterfall* 8318, valley of the Red River, 3 miles west and 7 south of Hollis, Harmon County, July 21, 1948. It is fairly abundant in the river valley.

Cory (*op. cit.*) does not list the species from the adjacent plains country in Texas. Tidestrom and Kittell[3] say that it occurs from Utah to California, southward to Texas, Mexico, and South America.

Cuscuta glabrior (Engelm.) Yuncker. Referred to this species is the author's 8680, from sandstone buttes, south of Tesequite Creek, 1 mile west and 4 south of Kenton, Cimarron County, August 24, 1948.

This species is not recorded in Jeffs and Little's list (*op. cit.*). The combination itself was not made until two years[4] after the publication of the list, but the name, *C. verrucosa* Engelm., not Sweet, applied to this species concept in 1930 is not on the Checklist. In the Flora of Texas,[5] Yuncker states that the

[1] Small, J. K., *op. cit.* 948. 1913.

[2] Cory, V. L., *op. cit.* 83. 1938.

[3] Tidestrom, Ivar and Sister Teresita Kittell. *A Flora of Arizona and New Mexico.* 583. 1941.

[4] Yuncker, Truman G. *The Genus Cuscuta.* Mem. Tor. Bot. Cl. 18 (2): 140–141. 1932.

[5] Yuncker, T. G., *Cuscuta* in Flora of Texas. 3 (2): 131–132. 1943.

species "ranges from New Mexico to Oklahoma and Louisiana and southward into northeastern Mexico."

DICHONDRA REPENS Forst., var. CAROLINENSIS (Michx.) Choisy has been previously reported[1] from LeFlore County. It is now known from McCurtain County as *Waterfall* 8062, woods 3½ miles south and 2 miles east of Tom, June 23, 1948, and *Nelson, Nelson* and *Goodman* 5574, moist, sandy openings in costal plain forest, near Harris, April 20, 1946.

*HELIOTROPIUM INUNDATUM Sw. This species was collected as *Waterfall* 8451, edge of Big Grassy Lake, 4 miles west and 4 south of Tom, McCurtain County, August 7, 1948.

Small[2] says the species occurs "in low grounds, Louisiana to California."

*VERBENA PLICATA Greene. Referred to this species is *Waterfall* 8663, stony soil near West Carrizo Creek north of the Black Mesa, 3 miles north and 1 west of Kenton, Cimarron County, August 23, 1948, and *Waterfall* 8347, silty soil in valley between gypsum ridges, 6½ miles south of Hollis, Harmon County, July 22, 1948.

Perry[3] does not list the species from Oklahoma, but cites it from Texas, New Mexico, Arizona, Chihuhua, and Coahuila.

*HEDEOMA PULEGIOIDES Pers. Referrable to this species is *Bebb* 5992, in woods, Adair County, Sept. 26, 1940.

Epling[4] includes Kansas and Arkansas in his statement of the range of the species.

*MONARDA PUNCTATA L., var. **intermedia** (McClintock and Epling), stat. nov. (*M. punctata* L., ssp. *intermedia* McClintock and Epling. *A Review of the Genus Monarda.* Univ. of Calif. Publ. in Bot. **20:** 184–185. 1942). *Waterfall* 8416 is apparently referrable to var. *intermedia.* The corollas are yellowish, and are purple-punctate. They have unexpanded tubes 6–7 mm. long, the calyx-tube has an orifice that is hairy, but not closed. These are key characteristics used by McClintock and Epling for their ssp. *intermedia,* "plants of the Texas prairie, mostly

[1] Hopkins, Milton. *Notes from the Bebb Herbarium of the University of Oklahoma.* II. RHODORA **45:** 275. 1943.

[2] Small, J. K. *Flora of the Southeastern United States.* 1913.

[3] Perry, Lily M. *A Revision of the N. Am. Spp. of Verbena.* Ann. Mo. Bot. Gar. **20:** 294–296.

[4] Epling, Carl and Wm. S. Stewart. *A Revision of Hedeoma* . . . Rep. Spec. Nov. **115:** 26–27. 1939.

east of the Brazos River." The author's collection was taken from sand, north of Clear Lake, 10 miles west and 1½ south of Idabel, McCurtain County, August 6, 1948.

CASTILLEJA INDIVISA Engelm. Pennell[1] cited only two collections from Oklahoma, one from Bryan County and one from Delaware County. From Atoka County I have *Waterfall* 7991, prairie, 1 mile south and 3 west of Atoka, June 21, 1948.

*SYMPHORICARPOS OCCIDENTALIS Hook. This species was collected as *Waterfall* 7945, canyon between sandstone hills, 6 miles south and 1 west of Kenton, Cimarron County, June 14, 1948.

Jones[2] lists no collections from Oklahoma, but cites the species from Kansas, Colorado and New Mexico.

*BAHIA WOODHOUSII Gray. Specimens of *Bahia* taken as *Waterfall* 7878, ditch in plains west of Boise City, Cimarron County, June 12, 1948 are referred to the above species by virtue of the prominent excurrent midrib of the pappus palea, and the achenes having an indument which is hirsutulous, becoming longer toward the base.

Kearney and Peebles[3] state that the range of the species is "Northwestern Texas, Colorado and northern Mexico." Stemen and Myers[4] report *B. oppositifolia* from Cimarron County. The author has seen no confirming collection.

*BERLANDIERA TEXANA DC., VAR. BETONICAEFOLIA (Hook.) T. & G. The author is referring to this variety his no. 8079 taken from a wooded creekside, 4 miles north of Broken Bow, McCurtain County, June 24, 1948.

This collection is characterized by long, jointed purplish hairs which cover most of the upper part of the stem including the peduncles. This is as Torrey and Gray[5] described var. *betonicaefolia*. They also state that the leaves are "all petioled". The upper cauline leaves of the present collection are sessile. However, Torrey and Gray further state: "Most of the specimens from Dr. Hale (western Louisiana) . . . have the peduncles and upper part of the stem clothed with purplish hairs . . .

[1] Pennell, *The Scrophulariaceae of Eastern Temperate North America*. 541. 1935.

[2] Jones, George Neville. *A Monograph of the Genus Symphoricarpos*. Journ. Arn. Arb. **21**: 224–228. 1940.

[3] Kearney, Thomas H. and Robert N. Peebles. *Flowering Plants and Ferns of Arizona*. 1942.

[4] Stemen, Thomas R. and W. Stanley Myers, *Oklahoma Flora*. 1937.

[5] Torrey, John and Asa Gray, *Flora of North America* **2**: 281.

just as Hooker describes his *Silphium betonicifolium*, but the upper leaves are all sessile, as in DeCandolle's plant . . .". It is just such material that the present author has, and which he is referring to var. *betonicaefolia*. Torrey and Gray cite material of this variety from Texas, western Louisiana and western Arkansas. In our herbarium none of the other Oklahoma material collected from widely separated localities has such indument.

*Eupatorium incarnatum Walt. Referred to this species is *Waterfall* 8430, margin of Red Lake, 12 miles west and ½ south of Idabel, McCurtain County, August 6, 1948.

*Helianthus angustifolius L. Referred to this species is *Waterfall* 8466, abandoned field, 2 miles north of Tom, McCurtain County, August 7, 1948.

In Small's *Flora* the range is given as "New York and Missouri to Florida and Texas."

*Liatrus pycnostachya Michx., forma **alba,** f. nov., corollis stylis et phyllariis albis.

The white flowered form was found abundantly intermingled with the common colored form, on a prairie 9 miles west and 1 mile south of Wapanucka, Johnston County, on August 5, 1948. It was collected as *Waterfall* 8396, which is designated as the type, and placed in the Bebb Herbarium of the University of Oklahoma. Isotypes will be sent to the Gray Herbarium and the herbaria of the New York and Missouri Botanical Gardens.

Liatrus squarrosa (L.) Michx., var. hirsuta Rydb. ex Gaiser. In her monograph of *Liatrus* Gaiser[1] cites one sheet from Oklahoma. It is *Waterfall* sin num., Tuskahoma, Pushmataha County, June 20, 1937. To this variety may also be referred *Waterfall* 8425, upland woods, 1 mile south and 2 west of Garvin, McCurtain County, August 6, 1948.

Pectis angustifolia Torr. has been previously reported[2] within the state based on *Demaree* 13,351 collected in 1936 from Cimarron County. The present author found the species growing in abundance in shallow sand on top of sandstone buttes near or under *Pinus ponderosa* and *P. cembroides* var. *edulis* south of Tesequite Creek, 1 mile west and 4 south of Kenton,

[1] Gaiser, L. O. *The Genus Liatrus*, Rhodora **48**: 401. 1946.

[2] Goodman, Geo. J. and U. T. Waterfall, *Notes on Oklahoma Plants*. Proc. Okla. Acad. Sci. **28**: 66. 1948.

Cimarron County, August 24, 1948. This is the only place in the state where the author has seen *Pectis* growing.

Specimens of the author's plants mentioned in the above enumeration will be found in the Bebb Herbarium of the University of Oklahoma. Available duplicates will be distributed to a few other herbaria at a later date.

Department of Botany and Plant Pathology,
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NEW RECORDS FOR THE BRUCE PENINSULA, ONTARIO

Dale J. Hagenah

Intensive field work whenever it has been possible to get away for a few days in that Mecca of botanists, the Bruce Peninsula of Ontario, has resulted in the finding of a number of additions to its known flora. During the past five years, in addition to species not reported by the late P. V. Krotkov in the systematic list in his "Botanical Explorations in the Bruce Peninsula, Ontario" (Trans. Roy. Can. Inst. **23** (1): 3–65. 1940), new stations have been found for several rare species reported by him. Records new for the area are indicated by an asterisk in the following list.

Particular attention has been given to the Pteridophyta and the Orchidaceae of the area and all the new records here reported are in these groups. A number of the finds, especially in the Orchidaceae, are due to Mrs. Hagenah's eye for botanical novelties. Specimens of all species not reported by Krotkov and of most of the others have been deposited in the Billington Herbarium of the Cranbook Institute of Science, Bloomfield Hills, Michigan. All numbers refer to collections of the author.

*Botrychium matricariaefolium A. Br. ex Koch. Specimens of this species were collected from the sides of low hummocks in a maple-birch woods three miles south of Tobermory, July 4, 1948, *759*.

*Botrychium multifidum (Gmel.) Rupr., var. intermedium (D. C. Eaton) Farw. Found in an abandoned pasture near the cemetery at Oliphant, October 9, 1949, *1430* and *1431*.

This Grape Fern was locally abundant, more than fifty plants being found in an area about fifty yards square, and was extremely

variable as to size of both sterile and fertile plants, with some of the smaller specimens, *1432* and *1434*, approaching var. TYPICUM in appearance.

*BOTRYCHIUM DISSECTUM Spreng., var. TYPICUM. Only one sterile plant of this species was found in a mixed woods near Red Bay, although both of the following varieties were present in both sterile and fruiting condition. October 8, 1949, *1426*.

*BOTRYCHIUM DISSECTUM Spreng., var. OBLIQUUM (Muhl.) Clute. Found in a mixed woods near Red Bay, usually in old roadways, September 6, 1948, *803*. Other plants were observed here in October, 1949.

*BOTRYCHIUM DISSECTUM Spreng., var. ONEIDENSE (Gilbert) Farw. Most of the plants seen at Red Bay in 1948 and 1949 had the broad, more rounded terminal segments of this variety. September 6, 1948, *802*.

*DRYOPTERIS PHEGOPTERIS (L.) C. Chr. One small but abundantly fruiting station was found at the edge of an opening in the swamp forest surrounding a bog southwest of the village of Lion's Head, September 5, 1948, *793*.

DRYOPTERIS FILIX-MAS (L.) Schott. This species, reported by Krotkov and others only from the vicinity of Cape Croker, was found at several places in a rocky beech-maple woods northwest of Hope Bay, at least six miles from the previously reported stations, August 31, 1947, *717*.

*DRYOPTERIS CRISTATA (L.) Gray, var. CLINTONIANA (D. C. Eaton) Underw. This variety has been collected in moist depressions in a mixed woods near Red Bay, September 6, 1948, *799*, and along a stream in woods near the Stokes Bay cemetery, October 8, 1949, *1428*.

ATHYRIUM THELYPTERIOIDES (Michx.) Desv. Reported by Krotkov from one collection made near the north shore of the Peninsula, this species was found in a moist valley between two dolomite ridges northwest of Hope Bay, July 3, 1949, *916*.

*ATHYRIUM PYCNOCARPON (Spreng.) Tidestr. Found on a low hummock at the foot of a dolomite ridge in a beech-maple woods northwest of Hope Bay, July 4, 1947, and collected August 31, 1947, *720*.

This colony bore abundant fertile fronds in 1947 but only sterile fronds were found in 1948. *Phyllitis Scolopendrium*, var. *americana* and *Polystichum Lonchitis* were abundant on the dolomite ridge while only a few yards away from the hummock on lower ground was the first clump of *Dryopteris Filix-mas* found at this station.

PELLAEA ATROPURPUREA (L.) Link.

This species was reported by Stebbins (RHODORA **37:** 63–74. 1935.) from cliffs along Georgian Bay near Gillies Lake and Lion's Head. It was rare at these locations and Stebbins stressed the fact that the cliffs appeared to have escaped the fires which had ravaged much of the Peninsula in the past. However, on October 8, 1949, this species was collected from a low rocky ridge in the dolomite pavement country about six miles west of Dyer's Bay, *1429*. Although there are obvious signs of past fires throughout this pavement region the *Pellaea* was not only abundant along the ridge but was occasionally seen in crevices between layers of the pavement itself.

*LYCOPODIUM OBSCURUM L., VAR. DENDROIDEUM (Michx.) D. C. Eaton. One small colony of the Round-branched Ground Pine was found on a sandy ridge in mixed woods near Red Bay, September 6, 1948, *798*.

*LYCOPODIUM COMPLANATUM L., first found near the Stokes Bay cemetery on October 8, 1949, *1427*, and again the next day at the foot of a sand ridge marking an old Lake Huron shore line south of Oliphant, October 9, 1949, *1443*.

*LYCOPODIUM TRISTACHYUM Pursh. Collected from another sand ridge near Oliphant, August 26, 1946, *397*.

At other places in this same series of wooded ridges collections have been made which resemble this species in form but lack its bluish-green color.

CYPRIPEDIUM CALCEOLUS L., VAR. PARVIFLORUM (Salisb.) Fern.

Under the name *Cypripedium parviflorum* Salisb. this yellow lady's-slipper was reported as common by Krotkov while the variety *pubescens* was reported only from one collection by A. B. Klugh. Five seasons of field experience in the Peninsula during the blooming season have shown that the actual frequency of the two is the reverse of that given by Krotkov. Variety *parviflorum* with its characteristic dark wine-colored sepals and petals has been found at only one locality, Little Port Elgin, May 31, 1946, *311*. Variety *pubescens* with its greenish-yellow sepals and petals occurs throughout the Peninsula in a variety of habitats, even growing in small pockets of humus in the dolomite pavement district.

*HABENARIA CLAVELLATA (Michx.) Spreng., var. OPHIOGLOSSOIDES Fern. Found growing in moss at the edge of the thicket

surrounding a small bog near Lion's Head, August 31, 1947, *726*. *Cypripedium acaule* was found near by.

HABENARIA ORBICULATA (Pursh) Torr. This species, reported only from Stokes Bay by Krotkov, was observed in a mixed woods near Red Bay in 1948 and 1949.

*HABENARIA HOOKERI Torr. Found in a sandy opening in coniferous woods near the shore at Dorcas Bay, May 31, 1947, and collected in bloom on July 4, 1947, *639*.

Interesting species noted near by included *Cypripedium arietinum* and *Iris lacustris*.

*ARETHUSA BULBOSA L. Collected from grassy margins of a marly bog near Lion's Head, July 4, 1947, *638*.

LISTERA CORDATA (L.) R. Br.

This species was reported by Krotkov from Cove Island, off the tip of the Peninsula, and then only from a solitary specimen. Stebbins (l. c.) mentioned seeing it at Red Bay. This station has not been rediscovered but this elusive little orchid has been found at three places in the vicinity of Oliphant where it is sometimes abundant in small areas, May 30, 1946, *306*. It has also been observed in a mossy thicket in a bog near Lion's Head. In nearly every case it has been associated with *Habenaria obtusata*.

MALAXIS BRACHYPODA (Gray) Fern. Reported by Krotkov from a collection by [? R. F.] Cain at Sauble Beach, this species was found at two locations in the Oliphant area on July 4, 1949, *917*.

*CORALLORRHIZA MACULATA Raf., forma FLAVIDA (Peck) Farw. This form, with the entire plant yellow except for the white, unspotted lip, was found to be rather frequent in one section of a wooded slope below a cliff at Sydney Bay, July 6, 1946, *342*.

Although the typical form of the species is commonly met with elsewhere in the Peninsula, it was not here observed in the same locality with the form. However, both have since been found growing in the same woods at Hope Bay.

CALYPSO BULBOSA (L.) Oakes. Like *Listera cordata*, this orchid was reported by Krotkov from a single specimen found on Cove Island. On May 31, 1947, three plants, two with flowers, were found near Oliphant in a low coniferous woods where *Listera cordata* is abundant.

However, it may have been overlooked elsewhere because of its early blooming habit. In this connection, it may be noted

that 1947 was a late season in this area and that large snow banks were still present in arbor vitae thickets near where the *Calypso* was found in bloom.

Cranbrook Institute of Science,
Bloomfield Hills, Michigan

ANDROPOGON ELLIOTTII CHAPM. IN ILLINOIS

Robert A. Evers

The Elliott Beardgrass, principally of the coastal plains from New Jersey to Florida and Texas, extends northward to southern Missouri and southern Indiana (Hitchcock, 1935) but has not been reported to occur in Illinois. Palmer and Steyermark (1935) listed it in four Missouri counties, and Deam (1940) credited it to ten Indiana counties.

In November, 1939, L. E. Yaeger collected this grass three miles southeast of Ridgway, Gallatin County, Illinois. He found it growing in an old upland field along with persimmon, Smilax and Panicum species. This appears to have been the first collection of this grass in Illinois.

In September, 1947, I attempted to find the site of Yaeger's collection but was not successful. In April, 1949, Glen S. Winterringer collected the grass in Pope County near Waltersburg. This collection was the first after Yaeger's in 1939.

In October, 1949, while collecting plants in southern Illinois, I made ten collections of *Andropogon elliottii* in five counties. I found it chiefly in old fields associated with *Andropogon virginicus*. It formed rather large colonies, or it occurred as isolated tufts. With the exception of Yaeger's collection near Ridgway, all collections are from the southern unglaciated area of the state. Although within the glacial boundary (Illinoian), the Ridgway site is not on glacial till but on the broad, sandy terrace (Wisconsin outwash) in the Wabash valley.[1] Deam has characterized this species in Indiana as being "restricted practically to the unglaciated area where it is usually found with

[1] Personal communication from Dr. George E. Ekblaw, Illinois State Geological Survey, Urbana.

Andropogon virginicus"; the same characterization fits entirely its known occurrence in Illinois.

Although present records show Elliott Beardgrass in only five southeastern Illinois counties, further field work may reveal its presence in other southern counties.

The following is a list of specimens of *Andropogon elliottii* in the herbarium of the Illinois State Natural History Survey.

GALLATIN Co.: In an old upland field, 3 miles southeast of Ridgway, November 7, 1939, *L. E. Yaeger;* roadside, Pounds Hollow Recreation Area, October 25, 1949, *R. A. Evers* 21898; in a field southeast of the Pounds, near the county line, October 25, 1949, *R. A. Evers* 21900. HARDIN Co.: In a field west of Karbers Ridge, October 25, 1949, *R. A. Evers* 21902; in a field east of Karbers Ridge, October 25, 1949, *R. A. Evers* 21903; in a field northwest of Rosiclare, October 26, 1949, *R. A. Evers* 21904. JOHNSON Co.: Field border northeast of Bloomfield, October 26, 1949, *R. A. Evers* 21908. POPE Co.: Field along highway 146, east of Waltersburg, April 3, 1949, *G. S. Winterringer* 1933 (determined by Agnes Chase); field border southeast of Herod, October 25, 1949, *R. A. Evers* 21901; in a field north of Homberg, October 26, 1949, *R. A. Evers* 21905. SALINE Co.: In a field one mile southeast of Rudement, October 25, 1949, *R. A. Evers* 21860; summit of Wamble Mountain, 2¾ miles southeast of Rudement, October 25, 1949, *R. A. Evers* 21881.

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ILLINOIS STATE NATURAL HISTORY SURVEY, Urbana

TWO NEW FORMS OF PLANTS FROM MINNESOTA.—ERIOPHORUM TENELLUM Nutt., f. **axillare,** f. nov., a forma typica differt pedunculo laterali ex axilla folii supremi (bracteae similis) uno- vel multo-spicato. TYPE: *Lakela* No. 8717, July 4, 1949, growing in *Sphagnum-Chamaedaphne* swamp on Fredenberg Lake road, Fredenberg T. 18 mi. N. of Duluth, St. Louis Co., MINNESOTA. (University Minn. Herb., Duluth Branch).

This form differs from the typical form by developing, in addi-

tion to the normal inflorescence, a lateral peduncle with one or more spikes, in the axil of the uppermost leaf, which has become bract-like. The plants were collected from a colony of typical plants in association with *Eriophorum virginicum* L., *Scheuchzeria palustris* L. and *Carex oligosperma* Michx.

CORYDALIS SEMPERVIRENS (L.) Pers., f. **candida,** f. nov., a forma typica differt sepalis petalisque albis, apicibus petalorum sulphureis. TYPE: *Lakela* No. 9022, July 15, 1949, growing in mats of *Cladonia* on a granite ridge, Rivard Road to Birch Lake about 12 mi. S. of Ely, Northeast St. Louis Co., Minnesota. (University Minnesota Herb., Duluth Branch).

This form differs from the typical form by replacement of the rose color of the sepals and petals by white, the petal-tips remaining yellow. These striking white-flowered plants were first observed on June 29, but only a single collection, No. 8672, was made at that time. The type material, collected two weeks later, was mostly in fruit. Britton & Brown, Illustr. Fl. of North. States and Can., Vol. 2, p. 144, refer to the color of the flower of the species as "rarely white"; the form appears to be undescribed. On drying, the sepal margins turned faint rose.—OLGA LAKELA, University of Minnesota, Duluth Branch.

ALCHEMILLA ALPINA IN COLORADO: The very characteristic *Alchemilla alpina* L., of alpine regions of Europe and common in Greenland, is generally recognized as found southward in North America only on the island of Miquelon. To be sure, Pursh, the author of countless erroneous records, wrote in his Fl. Am. Sept. i: 112 (1814):

> On the peaks of high mountains in Vermont and New Hampshire. 2l. June, July. *v. s.* Whether the American species is the true *A. alpina* or not, I am not able to determine, as I am at present in want of specimens to compare them; but the plate in the Flora Danica represents the American plant fully, as far as recollection can decide.

That was too vague. Nothing possibly identifiable with it is known from "the peaks of high mountains in Vermont", but the highest mountain of New Hampshire harbors the habitally very similar *Sibbaldia procumbens* L. Pursh gave the only station for the latter in New England as "high mountains of . . .

Vermont", although the only New England stations actually known to active explorers of our mountains are on the Mt. Washington area, chiefly near the head of Tuckerman's Ravine. For some unaccountable reason, Rydberg in N. Am. Fl. xxii[4]. 379 (1908), cites *Alchemilla alpina* southward only from "Miquelon and the White Mountains of New Hampshire". Why, if Pursh's unverified statement was being credited, discriminate against Vermont, where *Alchemilla* is equally unknown?

The object of this note, however, is not to guess what Pursh was guessing at. As a boy, before coming to Cambridge, I exchanged specimens with the late C. H. Demetrio. Among other plants he sent me was a characteristic specimen of *Alchemilla alpina*, collected by himself on July 5, 1888, "on the Trail to the Lake of the Clouds, Custer Co., Colorado". Here is a challenge to Cordilleran botanists.[1]—M. L. FERNALD.

[1] I remember that Demetrio was anxious to secure mosses and lichens from Maine. Being kept out of school through a long winter and being as much as possible out of doors, on skis, I offered to collect them for him. I well remember the delight of the family with his reply: "Spare your health; do not go out in the snow-crownded forest".

Volume 52, no. 613, including pages 1–24, was issued 20 January, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. March, 1950. No. 615.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. March, 1950 No. 615

LONG LIFE TO ALEXANDER W. EVANS

M. L. Fernald

In Rhodora, li. 178 (1949), I made a most embarrassing error. Referring to the conscientious editing by the late Charles A. Weatherby of papers sent in for publication, I commented on "those of the late Alexander W. Evans . . . who wrote unexcelled English". Momentarily pleased to have had such a painstaking contributor to the pages of Rhodora, I neglected to verify the statement of my informant, for it had been some time since I had had the satisfaction of handling one of Evans's manuscripts. Now, botanists, returning from the Christmas-week meetings at New York, report the presence there in vigorous health and with an amused laugh over the incident, of Evans, so alert and active that I am reminded of the day (August 7, 1917) when he and I tried to keep up with the lithe and slender Stanley Pease in climbing the vertical and slippery walls of Huntington's Ravine in the White Mountains. Evans, apparently, could still keep up; I certainly could not. I am, therefore, most happy to assert on the best of authority that, now past four-score, Evans is very much alive.

Whether the same can be said for the unwitting slanderer is another question. At any rate, a recent letter, received at the Gray Herbarium, expresses regret at the news, trickling through from New York, of the death of Fernald. As he has been assured, others have reasoned, because he was absent from the meetings, that he was no longer up to "manual labor". But Manual-labor was exactly what he was "up to" at that period (as for months past): rereading twelve hours a day the page-

proofs of the Manual and noting so many pranks of the printer's devil[1] as often to "wish he were dead". Certainly, his blunder was a boomerang!

There is special interest to me and the Harvard men of my period about the age, four-score plus. In our undergraduate days every student, whether of fine arts, the classics or the natural sciences, took, if he could get into the room, Shaler's "Geology 4", not because of the geology, which was a thin background, but because of Shaler's dramatic presentation and perpetual diversions into all fields of worldly wisdom. At the special lecture I refer to he suddenly stopped, then proceeded. "GENTLEMEN: Did you ever notice how those who follow literature or art soon tire and have nothing to absorb them in their later years, while students of Nature, whether geology or natural history, have a life-long interest and greatly outlive their literary and artistic friends?" That thesis has stuck with me and many others and I have been interested, in odd moments, to make a check of the active workers (at least before some of them specialized in the lower groups), whether in the herbarium or out-of-doors (when they stored up what would now be called "sunshine vitamins") in my own field, taxonomy of vascular plants. One could start with Theophrastus but I have contented myself with active Americans or workers in temperate North America (thus excluding Humboldt, 90, and others in tropical America). Briefly tabulated and noting only about sixty out of hundreds we get lists for the past such as the following (some, as above noted, later concentrating outside the vascular plants):

LIVING TO **83** YEARS: William D. Brackenridge, Addison Brown, John Carey, Edwin H. Eames, Joseph T. Rothrock, Charles W. Swan, David Thomas; TO **84** YEARS: William Bartram, John M. Bates, George B. Emerson, Fayette F. Forbes, Ellsworth J. Hill, Leo Lesquereux, Lewis H. Lighthipe, Charles H. Peck, Carl Purdy, William W. Wister; TO **85** YEARS: Joseph Barratt, Charles D. Lippincott, François André Michaux, John C. Parlin, Henry H. Rusby, William Trimble, Richard W. Woodward; TO **86** YEARS: Florence Beckwith, Thomas H. Macbride, Alfred Rehder, Charles S. Sargent; TO **87** YEARS: John Clayton, Robert I. Cratty, James Hall, Joachim H. Schuette, Frank Lamson-Scribner; TO **88** YEARS: Joseph R. Churchill, John G. Jack, John M. Macfarlane, John Macoun, Archibald

[1] For instance, altering (after the galley-proofs) such an expression as "flowering stems arising from the slender tips of past year's stolons" so that the last words read: "the slender tips of past year's solons", whereupon I was asked if that were my impression of retired lawmakers.

Menzies, Albert Ruth, William Trelease; TO **89** YEARS: James H. Carruth, Louis F. Henderson, Robert Peter, Robert A. Ware; TO **90** YEARS: Alvan W. Chapman, Albert Commons, Samuel B. Parish; TO **91** YEARS: William J. Beal, Eliphalet W. Hervey; TO **92** YEARS: Joseph C. Arthur, Jacob Bigelow, Herbert M. Denslow, Henry Detwiller, John Mitchell, Edward S. Steele; TO **93** YEARS: John Goldie, Alexander Prior; TO **94** YEARS: James Fowler; TO **96** YEARS: John W. Dunlop; TO **97** YEARS: Kate Furbish; TO **99** YEARS: Edo Claassen, John Donnell Smith.

An even more inspiring group, at least to us younsters, is that bevy of active workers now with us, such leaders as

Otto F. Cook (83), Jesse More Greenman (83), Chauncey D. Beadle (84), Nils E. Hansen (84), Jared G. Smith (84), Charles C. Deam (85), Cornelius L. Shear (85), Ivar Tidestrom (85), Ernest C. Smith (86), Anna Murray Vail (87), Alice Eastwood (91), L. H. Bailey (92), Charles F. Batchelder (94), John Dearness (98).[1]

Rather strikingly, the century-mark seems to be rarely attained. Of the active North American workers in this limited field I know of none who have come nearer than Edo Claassen and John Donnell Smith. In Europe it has been attained almost as rarely. As notable a near-centennarian as any is HERMANN CHRIST (99 years, 11 months), the great Swiss pteridologist. Early members of the New England Botanical Club will never forget his name. The late George E. Davenport, a very painstaking and accurate student of ferns, was temperamentally not given to humor. At one meeting, reviewing the "rude" and "insulting" remarks regarding his work published by a student (who later committed suicide) at an institution outside New England, he said, with tears in his voice: "I have stood these insults as long as I can. Finally, I referred the matter to Christ (pronouncing the vowel as if it were a long **i** in English). He has just sent me his reply, in which he highly approves my judgment."

In view of the evident truth of Shaler's thesis and the greatly lengthened "life-expectancy" of the present over past generations we all look forward with confidence and keen interest to the future studies[2] of Alexander Evans and his elders in the botanical field.

[1] If others wish to enroll in this highly honored group a note to that effect will be greatly appreciated.

[2] Like the 60-page manuscript and the plate received from Evans as this is sent for paging!

MONTANA PLANT-DISTRIBUTION RECORDS

W. E. Booth and Janet Stentz

A number of additions to the state flora have been found in collections made by the authors and in older collections filed in the Montana State College Herbarium.

Najas flexilis (Willd.) Rosth. and Schmidt. Collected by *Charles Buck* in Flathead Lake, near Creston, Flathead County, Montana.

The plants grow in water up to eighteen inches deep. August 17, 1937. This plant has been reported as being in Montana, but this is the first specimen in the Montana State College Herbarium.

Eragrostis hypnoides (Lam.) B. S. P. Collected by *W. E. Booth* in Fromberg, Carbon County, Montana; August 2, 1941.

Eragrostis pectinacea (Michx.) Nees. Collected by *W. E. Booth* near Polson, Flathead County, Montana, September 2, 1942.

Festuca megalura Nutt. Collected by *W. E. Booth* five miles west of Bozeman, Gallatin County, Montana.

The stand consisted of a few plants growing along the railroad track in dry, rocky soil; July 21, 1946.

Agropyron saxicola (S. & S.) Piper. This species is represented in Montana by the single collection made by *P. H. Hawkins* at Lake Abundance, Montana, in 1914.

Aegilops cylindrica Host.

This grass, formerly thought to be mostly in the central and southern United States, has appeared in Montana at numerous locations in grain fields. In some areas it is sufficiently abundant to be considered as a pernicious weed.

Calamagrostis koelerioides Vasey. This species is new to Montana, but is reported from adjoining states to the west. It was collected in Glacier National Park by *W. E. Booth* near Avalanch Campgrounds, growing in a sandy, moist soil, where it was represented by three isolated clumps. July 31, 1942.

Calamagrostis scopulorum M. E. Jones. Collected by *G. F. Payne* in the Gallatin Canyon, south of Bozeman, Montana at an altitude of about 8500 feet; August 21, 1949.

It appears in small scattered clumps on an eroded slope near the junction of Lightning and Taylor Fork creeks.

Sporobolus neglectus Nash. Two Montana collections of this species have been made. *W. L. Jellison*, on September 15, 1927, collected a sample from the College Experiment Station Farm at Bozeman, Montana. A second collection was made by *W. E. Booth* on August 11, 1941 in open grassland, two miles south of Harlowtown, Montana. This stand was represented by a few scattered bunches of the grass.

Sporobolus vaginiflorus (Torr.) Wood. This plant is represented in Montana by a single collection made September 4, 1941 by *W. E. Booth*. It was growing along a road near Wyola, Bighorn County, Montana, in dry sandy soil.

Carex eburnea Boott. Collected near Ekalaka, Carter County, Montana by *E. C. Moran*, August 11, 1941, no. 132.

Maianthemum canadensis Desf. Collected by *W. E. Booth* one mile south-east of Alzada, Carter County, Montana. Several plants were growing on a shaded, deep humus bench above the river; June 19, 1949, no. 2622.

Scabiosa arvensis L. Collected by *W. E. Booth* twelve miles south-west of Bozeman, Montana and about 2 miles south of the Bozeman Hot Springs. Several large clumps of the plant were growing along the roadside in a moist ditch. September 10, 1947. The plant was identified by *B. Maguire*.

Bellis perennis L. Collected by *L. Stone* near Perma, Sanders County, Montana on May 5, 1941.

Tetradymis spinosa H. and A. Collected in Wibaux County, Montana, in May 1939 by *G. W. Griffins*.

Centaurea nigra L. Collected by *J. S. Gordon* near Troy, Lincoln County, Montana; August 22, 1932.

This was a weed-specimen sent to Montana State College for a determination. The identification was made by Mr. *Gerald Clary*.

Herbarium, Montana State College,
Bozeman, Montana

The Authorities for Torreyochloa Fernaldii (Gramineae).—In a recent paper, G. L. Church published a cytotaxonomic study of *Glyceria* and *Puccinellia*. From the former genus he removed several species and published them, in Amer. Journ. Bot. xxxvi. 163–164 (1949), as the new genus *Torreyochloa*. In the writer's opinion this new genus was well substantiated by significant morphological characters.

This brief note is written only to make a minor correction in the authorities for one of the species. *Torreyochloa Fernaldii*

(St. John) Church was a transfer based upon *Glyceria Fernaldii* (Hitchc.) St. John, Rhodora xix. 76 (1917); ultimately based upon *Glyceria pallida* var. *Fernaldii* Hitchc., Rhodora viii. 211 (1906). The synonyms and the indication of the basonym were correct as stated by Church. However, it is clear that the original author of the name *Fernaldii* was Hitchcock in 1906. No impediment existed to the transfer of this varietal name. Hence, the binomial, with corrected authorities, should read: *Torreyochloa Fernaldii* (Hitchc.) Church.—Harold St. John, University of Hawaii, Honolulu 14, T. H.

STUDIES OF MINNESOTA FLOWERING PLANTS WITH NOTES ON ADDITIONS TO THE FLORA[1]

John W. Moore

During the past few years data have been accumulated on some minor variations of Minnesota plants. Names are here being proposed for these varients. Collecting in Minnesota has made possible the addition of several plants which do not seem to have been recorded as growing in Minnesota.

Plant collections are referred to by number and unless otherwise stated were gathered by the author in various parts of the state.

Echinochloa Walteri (Pursh) Nash forma laevigata Wieg. This form was collected one mile east of Caledonia, Houston County, No. 15960, Aug. 22, 1943.

Eleocharis ovata (Roth) R. & S. var. **aphanactis** varietas nova. Speciei similis sed achenia non setosa sunt. The nutlets are without bristles. This interior variety seems to be confined in Minnesota to the shores and islands of Lake of the Woods and the Rainy Lake drainage.

Collections have been made as follows: growing along the north shore of Magnuson Island, Lake of the Woods County, *John W. and Marjorie F. Moore*, No. 11294 (type), July 29, 1939; growing on sandy shore at the mouth of the Rapid River, Clementson, Lake of the Woods County, *John W. and Marjorie F. Moore*, No. 12010, Aug. 22, 1939; and growing on sandy shore along the Rainy River at Clementson, Lake of the Woods County, *John W. and Marjorie F. Moore*, No. 12102, Aug. 24, 1939.

[1] Contributions from the Herbarium of the University of Minnesota XV. Field work was supported in part by grants in aid of research from the Graduate School of the University of Minnesota.

CAREX FILIFOLIA Nutt. was first collected in Minnesota by Professor O. A. Stevens of Fargo, North Dakota (gravelly knoll of prairie, Muskoda (Clay Co.) May 18, 1938, *O. A. Stevens* No. 321). Subsequent collections in Minnesota have been made in three other counties: prairie knoll, 4½ miles north of Marietta, Lac qui Parle County, No. 13162, June 21, 1940; Inspiration Peak, Ottertail County, *J. W. Moore and B. O. Phinney,* No. 12709, May 25, 1940; and Prairie 2½ miles south of the Gary Road, Yellow Medicine County, No. 13154, June 21, 1940.

It is to be expected at other localities on high gravelly knolls in the north western part of the state.

CAREX LAXIFLORA Lam. This broad-leaved species with distant perigynia in the spike was collected on a hillside, 2 miles up the Root River from Peterson, Fillmore County, No. 15996, Aug. 24, 1943.

There have been many reports of *Carex laxiflora* from Minnesota, beginning with Upham's report in 1884. The plants so named have been *Carex blanda* of Dewey, an abundant sedge in Minnesota.

CAREX OBTUSATA Leljebl. was first collected in Minnesota by O. A. Stevens near Muskoda, Clay County. A collection of this boreal species was made on prairie, 1½ miles east of Karlstad, on Highway 11, Kittson County, by *J. W. Moore and E. P. Thatcher*, No. 14445, June 14, 1941. Professor Stevens made an additional collection on sandy prairie near Muskoda, No. 1052, on June 17, 1948.

TRADESCANTIA BRACTEATA Small forma **albiflora** forma nova. Corollis albis. The albino form of the species was growing in a prairie strip along the railroad right-of-way 6 miles east of Courtland, Nicollet County, No. 13031, June 19, 1940.

The plants were growing with the typical purple flowered form and with a roseate series which is being given the name

TRADESCANTIA BRACTEATA Small forma **rosea** forma nova. Speciei similis sed corollis roseis. The TYPE collection is No. 13041, June 19, 1940.

POLYGONATUM CANALICULATUM (Muhl.) Pursh var. **rotundifolium** varitas nova. Foliis late ellipticis vel subrotundatis et obtusis, pro medio 10–12 cm. longis, 6–8 cm. latis; floribus late campanulatis, 15–18 mm. longis, 7–10 mm. latis. With leaves broadly elliptical or nearly orbicular, obtuse, the longest median leaves 10–12 cm. long, 6–8 cm. wide; flowers broadly campanulate, 15–18 mm. long, 7–10 mm. wide.

This variety was collected from a ravine of the Minnesota River bluffs, 1 mile south of the Mendota Bridge, Dakota County, by *J. W. and M. F. Moore,* No. 12955, June 12, 1940.

Polygonatum canaliculatum (Muhl.) Pursh forma **foliatum** (H. M. Clarke) status nov. *Polygonatum commutatum* (Schultes f.) A. Dietrich forma *foliatum* Herbert M. Clarke, Am. Midland Nat. **39:** 762, fig. 1, 1948.

This interesting bracteate form of *Polygonatum canaliculatum* was collected in June 1895 by Max Menzel at Pipestone, Minnesota. A note on the sheet states "with curiously developed bracts." This seems to represent a bracted state comparable with *Polygonatum biflorum* (Walt.) Ell. forma *ramosum* (McGivney) Fernald.[1]

Sisyrinchium campestre Bicknell forma **albiflorum** forma nova. Speciei simile sed corollis albis. The albino form was growing in prairie west of the railroad tracks along Highway 63, ½ mile south of Racine, Section 35, Racine Township, Mower County, *J. W. Moore and E. P. Thatcher*, No. 13847, May 10, 1941.

Quercus ellipsoidalis E. J. Hill var. **kaposianensis** varitas nova. A *Quercus ellipsoidalis* differt quod involucre fructiferum nuces includit et maturitate fere ⅔ longitudinis eas tegit. The variety differs from the species in having the cups tightly enclosing the acorns and covering them for about ⅔ their length at maturity. The variety grew in Kaposia Park, South St. Paul, and specimens were collected, No. 15216, on October 10, 1941. The fruits are ellipsoidal with an acute apex and, as in *Q. ellipsoidalis* proper, are marked with dark longitudinal stripes.

Stellaria longifolia Muhl. var. **typicus** status nov. *Stellaria longifolia* Muhl. ex Willd. Enum. Hort. Berl. 479, 1809. This is the plant with greenish or greenish yellow capsules.

Stellaria longifolia Muhl. var. **subaequalis** varitas nova. A varietate typica differt quod capsulae calycibus aequales sunt vel paulo superant, semina oblonga sunt. It differs from the typical variety in having the pods equaling or but little longer than the sepals; the seeds are oblong. Plants were abundant and growing in swampy ground, east side of Tilson Bay, Rainy Lake, Koochiching County, *John W. and Marjorie F. Moore,* No. 11846, Aug. 17, 1939.

Stellaria longifolia Muhl. var. **atrata** varitas nova. Varietati typicae similis nisi quod capsulae lucidae atro fuscae sunt; sepala exteriora ciliolata sunt. It is similar to the typical variety but with the capsules lustrous brownish black and the

[1] Rhodora, 46: 12, 1944.

exterior sepals ciliolate. This localized varient was obtained in mature fruit in July and is the second of two varieties of Lake of the Woods region. The plants were growing in a white cedar bog, in sphagnum, east side of Pine Creek, Angle Inlet, *John W. and Marjorie F. Moore*, No. 11135, July 25, 1939.

STELLARIA ULIGINOSA Murr. was listed by Upham in his Catalogue of the Flora of Minnesota, page 181, 1884, from "Fond du Lac, at west end of Lake Superior, Miss Herrick, North." In 1895 J. M. Holzinger of the Winona Normal School collected the species at Lamoille Cave, Winona County, Minnesota, June 20. The plant has a label bearing the name *Alsine longifolia*. It is in good flower and fruit and belongs here. On September 18, 1936, Dr. C. O. Rosendahl collected a *Stellaria* at his home, which proved to be this species. The plants were growing in shady places in lawn (under walnut tree and along fence covered with grape vine). The label with the plants notes "never noticed in flower at this place, St. Anthony Park, St. Paul, Minnesota."

ANEMONE QUINQUEFOLIA L. var. INTERIOR Fernald forma **rubra** forma nova. Varietati similis sed floribus rubro-tinctis. This form is differentiated by its reddish tinted flowers. The TYPE, No. 12775, was collected in woods, SE¼, Section 8, Effington Township, Ottertail County, by *J. W. Moore and B. O. Phinney*, May 26, 1940.

NESLIA PANICULATA (L.) Desv. Specimens of this European weed were collected on a prairie strip along the railroad, ¼ mile east of Gibbon, Sibley County, No. 13234, June 22, 1940. An additional collection was made by John B. Moyle, No. 3952, in Chippewa County, near Watson, where it was noted as infrequent along the road, July 23, 1945.

SPIRAEA ALBA DuRoi forma **rosea** forma nova. A *Spiraea alba* differt corollis roseis. The form with pink petals was collected along the roadside 1½ miles south of Runeberg, Becker County, by *J. W. Moore and D. L. Jacobs*, No. 14854, June 8, 1941.

RUBUS IDAEUS L. var. STRIGOSUS (Michx.) Maxim. forma **niveus** forma nova. A varietate *strigosus* differt foliis subter niveo-tomentosis, foliolis primocanorum late ovatis, caulibus cinereis. It differs from variety *strigosus* in having the leaves snowy white-tomentose on the lower surface, the leaflets of the primocanes broadly ovate, and the stems cinereous. The new form was found growing on a low hill, east side of Tilson Bay, Township 71, Range 23W, Rainy Lake, Koochiching County, *John W. amd Marjorie F. Moore*, No. 11751, Aug. 14, 1939.

Rosa Eglanteria L. escaped from cultivation and was growing along the west shore of Chub Lake, Dakota County, No. 15875, June 30, 1943.

Oxalis violacea L. forma alba Fassett (Trans. Wisc. Acad. of Sci., **22:** 174, 1933). The white or albino form was collected on an original prairie strip along a railroad right-of-way, 1 mile east of Westport, on Highway 28, Pope County, by *J. W. Moore and B. O. Phinney*, No. 12665, May 25, 1940.

Impatiens capensis Meerb. forma Peasei (A. H. Moore.) Fern. & Schub. The roseate form of the species was found growing in balsam forest in association with white spruce, green ash, beaked hazel, and *Acer spicatum* at Pelland, Koochiching County, *John W. and Marjorie F. Moore*, No. 11933, Aug. 19, 1939.

In these plants the lip of the corolla in addition to being spotted was tinged with light red.

Cornus racemosa Lam. forma **Nielseni** forma nova. Speciei similis sed foliis colore helvo variegatis. The specimen differs from the typical species in having the leaves variegated with yellow. This striking form was collected by *Ellar Nielsen* in a maple-elm forest northwest of Long Lake, Detroit Lakes, July 5, 1933, No. 2116, and was said to have been taken from a shrub 6 feet tall at the time the collection was made.

Plox divaricata L. var. Laphamii Wood forma **bicolor** forma nova. Corollae est limbus caeruleus et albus et striatus. The corolla-limb is blue and white striped, making an outstanding varient which was collected at the mouth of the Root River in woods by the road, Houston County, by *J. W. Moore and Bernard O. Phinney*, No. 14278, on May 2, 1942.

The blue and white striped corolla limb is quite in contrast with the pale blue corollas of the variety in this region.

Prunella vulgaris L. var. **parviflora** (Gilib.) combinatio nova. *Prunella parviflora* Gilib. Fl. Lithuan. II, 88, 1781 and Exerc. Phytol. **1:** 99, 1792.

This plant has appeared in lawns in the eastern United States. It is now established in Minnesota. Specimens from the lawn of Lloyd M. Short of Minneapolis (65 Clarence Avenue S. E., Minneapolis, Hennepin County, June 8, 1943) were presented to the Herbarium of the University of Minnesota for determination in 1943.

Physostegia formosior Lunell forma **alba** forma nova. Corollis albis. The white flowered form was found growing in

wet ground ¼ mile northwest of Warroad, Roseau County, *John W. and Marjorie F. Moore,* No. 11399, Aug. 2, 1939.

GALEOPSIS TETRAHIT L. var. BIFIDA (Boenn.) Lej. and Court. was first collected by C. O. Rosendahl in moist soil near a spring below Spring Grove parsonage, Houston County, Aug. 11, 1928. A second station for this small flowered variety was found by the writer and a collection made in a creek bottom, 1 mile east of Austin, Mower County, No. 14902, Aug. 2, 1941.

LINARIA MINOR (L.) Desf. (*Chaenorrhinum minus* (L.) Lange), an interesting annual, was first found in Minnesota in 1940. It was growing as a weed on a railroad right-of-way, southeast ¼, section 1, Mankato Township, Blue Earth County, No. 13025, June 19, 1940. Miss Olga Lakela has since found the plant growing along railroad tracks, in gravel at New Duluth, on Sept. 9, 1945.

ASTER LONGIFOLIUS Lam. var. VILLICAULIS A. Gray forma **pallens** forma nova. A varietate differt ligulis subcaeruleis. Plants of this form were found growing in peat soil near the international boundary line north of Longworth at an elevation of 1072 feet, Roseau County, *John W. and Marjorie F. Moore,* No. 11381, Aug. 2, 1939. The rays had a faint blue tint rather than dark purple as in the northeastern states.

ASTER INTERIOR Wiegand has been collected twice from Minnesota: growing on rocky shore at mouth of Rapid River, Clementson, Lake of the Woods County, *John W. amd Marjorie F. Moore,* No. 12001, Aug. 22, 1939; and plants growing in opening in poplar woods, 0.8 of a mile west of the Big Fork River, Reedy Township, Koochiching County, *John W. and Marjorie F. Moore,* No. 12060, Aug. 23, 1939.

ERIGERON PULCHELLUS Michx. forma **Tolsteadii** (Cronquist) status nov. *Erigeron pulchellus* Michx. var. *Tolsteadii* Cronquist, Brittonia, **6:** 248, 1947. The type specimen of the albino form is No. 34 of *W. L. Tolstead,* collected near Lake City, Goodhue County, Minnesota, June 15, 1937.

ANTENNARIA APRICA Greene, a western species, was reported for Minnesota in 1932 by Rydberg in his Flora of the Prairies and Plains of Central North America. The several collections deposited in the University of Minnesota Herbarium indicate that *Antennaria aprica* is a common species in North Dakota. A collection was made in Minnesota from sandy hills about 1½ miles south-west of Fertile, Polk County, by *J. W. Moore and E. P. Thatcher,* No. 14361, June 14, 1941.

ANTENNARIA APRICA Greene var. **aureola** (Lunell) status nov. *Antennaria aureola* Lunell, Am. Midland Nat., **2:** 288, 1912.

While examining related species, a study was made of *Antennaria aureola* Lunell. This plant differs from *Antennaria aprica*

only in the relatively narrow outer involucral bracts that are rounded obtuse or subacute. In pubescence of the leaves and other fundamentals of leaf size and shape, flowering stem bracts, and flower structure the affinity seems too close to retain the entity as a species. *Antennaria aureola* is considered a variety of *Antennaria aprica.*

Antennaria microphylla Rydb. (*Antennaria Solstitialis* Lunell). No. 14482 was found growing in a low meadow, South East ¼, Section 36, Excet Township, Marshall County, by *John W. Moore and E. P. Thatcher,* June 15, 1941. Dr. J. Lunell described staminate plants of this species as *Antennaria Solstitialis* Lunell.

Xanthium oviforme Wallr. There are two collections of this species from Minnesota: one from plants growing on sandy beach of Rocky Point, Lake of the Woods, Lake of the Woods County, *John W. and Marjorie F. Moore,* No. 12156, Aug. 27, 1939; the other from plants growing on shore, south side of American Point, Lake of the Woods County, *John W. and Marjorie F. Moore,* No. 11327, July 31, 1939.

Helianthus Nuttallii T. & G., typically a plant of the more arid western and southwestern United States, enters the northern border region of Minnesota. Plants were found growing in sandy ground ¼ mile northwest of Warroad, Roseau County, by *John W. and Marjorie F. Moore,* No. 11402, Aug. 2, 1939.

Achillea multiflora Hook. until now has been known from as far east as the Turtle Mountains, Rolette County, North Dakota, where it was collected by Dr. J. Lunell in 1910 and 1912. In Minnesota it was found growing in peat soil 1.3 miles north of Longworth, Roseau County, *John W. and Marjorie F. Moore,* No. 11361, Aug. 2, 1939.

This is the easternmost known station in the United States.

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Minneapolis, Minnesota

Volume 52, no. 614, including pages 25–48 and plate 1156, was issued 22 February, 1950.

RHODORA

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. April, 1950. No. 616.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—**A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.**

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Subscriptions (making *all remittances* payable to RHODORA) to
Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
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HABENARIA ORBICULATA, var. LEHORSII: FIG. 1, inflorescence, × 1, from TYPE; FIG. 2, inflorescence, × 1, from TOPOTYPE.

H. ORBICULATA, passing to var. LEHORSII: FIG. 3, inflorescence, × 1, from Lookout Mt., Bonne Bay, Newfoundland; FIG. 4, fruit, × 1, from Bay of Islands, Newfoundland.

H. ORBICULATA, var. MENZIESII: inflorescence, × 1, from Flathead Lake, Montana.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. April, 1950 No. 616

A SMALL FASCICLE OF NOVELTIES

M. L. Fernald

(Plates 1157—1160)

In partially clearing the record before the issue of the 8th edition of Gray's Manual it is important to discuss some interesting plants of our flora which have been held over until they could receive proper study. The first two discussions are accompanied by four of Dr. Schubert's very clear plates. The cost of their reproduction has been generously met by Mr. Bayard Long.

I. A Study of Habenaria orbiculata (Plates 1157 and 1158)

Habenaria orbiculata (Pursh) Torr., var. **Lehorsii,** var. nov. (tab. 1157, fig. 1 et 2, × 1), planta parva foliis 6–9 cm. longis 4–5 cm. latis; scapo 7–11 cm. alto; racemo 2–5.5 cm. longo, 2–4 cm. crasso floribus confertis, internodiis imis 1–8 mm. longis; pedicellis 2–4 mm. longis crassis; labio 7–10 mm. longo; calcare 0.8–1.5 cm. longo.—St. Pierre et Miquelon: bare spots among Ericaceous shrubs on a denuded hill, Cap à l'Aigle, July 25, 1945, *Mathurin Le Hors* (type in Herb. Gray); same station, August 2, 1949, *Le Hors.*

Var. *Lehorsii* is the most extreme departure from typical *Habenaria orbiculata* (our t. 1158, figs. 1 and 2) of moist to dry woodlands from southern and western Newfoundland to Thunder Bay District, Ontario, and Minnesota, thence south to Nova Scotia and the Northern States and on the uplands to South Carolina and Tennessee. In its more northeastern and bleak habitats, the latter (typical) plants somewhat approach var. *Lehorsii;* and some of them, especially on or among the mountains of western Newfoundland (t. 1157, figs. 3 and4, × 1) go as well with that

as with true *H. orbiculata*. The type- and topotype-series of var. *Lehorsii* stand off on several characters from the continental (and rarely insular) plant as these are displayed in the 153 collections of the latter before me. These are summarized below and the details of the inflorescence are shown in T. 1158, FIGS. 1 and 2:

H. ORBICULATA (typical), T. 1158, FIGS. 1 and 2, ×1: Leaves 0.6–2 dm. long, 0.4–2 dm. broad: scape 1.5–5 dm. high, with (1–)2–5 bracts; raceme lax and open, 0.7–2.5 dm. long and 3.5–8 cm. in diameter, the flowers 0.8–2.5 cm. apart; pedicels filiform, 6–13 mm. long in maturity; spur 1.6–2.7 cm. long; lip 1–1.5 cm. long.

Var. LEHORSII: Leaves 6–9 cm. long, 4–5.5 cm. broad; scape 7–11 cm. high, with 0–2 (rarely 3) bracts; raceme dense, 2–5.5 cm. long, 2–4 cm. in diameter, the lower flowers 1–8 mm. apart; pedicels stout, 2–4 mm. long; spur 8–15 mm. long; lip 7–10 mm. long.

Habenaria orbiculata, var. *Lehorsii* of open heathy barrens is thus quite parallel with *H. Hookeri* Torr., var. *abbreviata* Fernald in RHODORA, XXXV. 239, t. 252 (1933), that dwarf and endemic Newfoundland variety of a continental woodland species known likewise on open heathy barrens, which are carpeted by *Juniperus communis*, var. *saxatilis* Pallas, *Empetrum nigrum* and *Dryas integrifolia* (l. c. 54). When *H. Hookeri*, var. *abbreviata* was described I pointed out (RHODORA, l. c. 8, 9, 87 and 88) the remarkable occurrence on open barrens or mountain-tablelands of a phase of *H. orbiculata* which greatly puzzled Long, Fogg and myself, saying: "other southern species on French Island [Bay of Islands] which seemed absolutely out of place in close proximity to [dominantly Arctic] *Silene acaulis* and *Saxifraga oppositifolia* (MAP 1) were *Cypripedium reginae* Walt . . . and *Habenaria orbiculata* (MAP 9) . . . *Habenaria orbiculata* was so abundant as to be almost dominant in dry peat and gravel within a stone's throw of the open shore. In New England and eastern Canada we had always thought of it as an orchid of the richest of old woodlands; but its choice of habitat on bleak French Island [fruiting raceme in T. 1157, FIG. 4, × 1] was only a breaking of the ice for our next station for it. In 1929 we found it [flowering raceme as T. 1157, FIG. 3, × 1] vying with the arctic *Scirpus cespitosus* var. *callosus* (MAP 10) for possession of a sphagnous pocket on the high tableland of Lookout Mountain at Bonne Bay". As to the station on Lookout Mountain, at an altitude approaching 500 m., whereas close to sea-level at the western base of the mountain the arctic *Oxyria digyna* abounds, the fol-

lowing record was made (pp. 87, 88): "As already stated, *Habenaria orbiculata* (MAP 9) was here growing in turf of the ubiquitous arctic-alpine *Scirpus cespitosus* var. *callosus* (MAP 10). We had difficulty in believing our own eyes and, at my request, Fogg made detailed drawings of its flowers, lest we might forget how the fresh flowers appeared, but we cannot make it anything but *H. orbiculata* of 'rich woods' on the continent".

In the light of the present study it has become evident that the plants of open barrens of western Newfoundland (FIGS. 3 and 4), although with longer and slightly less crowded racemes and larger leaves than in the LeHors material, have the short and thick pedicels of the latter and relatively short spur and lip. They are transitional in all characters.

In summarizing (l. c. 240) in 1933, I said: "I am unable to find any tangible character to separate this extreme series from the larger Alleghenian plant and particularly from the plants of western North America", the latter plant described as *Platanthera Menziesii* Lindl. Gen. Sp. Orchid. Pl. 286 (1935). This plant, however, seems sufficiently definite (our T. 1157, FIG. 5) as to stand as an isolated northwestern variety, rather closer to the Newfoundland plant than to the wide-ranging eastern continental *H. orbiculata*, var. *typica:*

HABENARIA ORBICULATA (Pursh) Torr., var. **Menziesii** (Lindl.), stat. nov. *Platanthera Menziesii* Lindl. Gen. Sp. Orchid. Pl. 286 (1835). *Lysias Menziesii* (Lindl.) Rydb. Fl. Rocky Mts. 178 (1917).

When var. *Menziesii* is separated from the more eastern *Habenaria orbiculata* and *H. macrophylla* Goldie in Edinb. Phil. Journ. vi. 331 (1822), with both of which it is often confused, it stands out, at least as shown in the 12 numbers in the Gray Herbarium, through its relatively small leaves (5–15 cm. long and 4–12 cm. broad; in typical *H. orbiculata* up to 2 dm. long and broad); scape 1–2 dm. high (in typical *H. orbiculata* 1.5–5 dm. high); stricter raceme, the longest scarcely 2 dm. long and with 12–20 remote flowers (longest racemes of eastern typical *H. orbiculata* up to 2.5 dm. long and with 25–50 flowers); pedicels stoutish (as opposed to filiform); spur at most 2.2 cm. long (in the East up to 2.7 cm.). Although the thickish pedicels usually found in var. *Menziesii* had earlier suggested to me those of var.

Lehorsii and transitions to it, the shorter pedicels, crowded flowers and shorter spur and lip clearly distingush the latter from the former.

Much confusion has arisen through the inclusion in *Habenaria orbiculata* or *Lysias orbiculata* (Pursh) Rydb., originally described by Pursh as *Orchis orbiculata* Pursh. Fl. Am. Sept. ii. 588 (1814) from "shady beech-woods: on the mountains of Pensylvania and Virginia", of the technically quite different *H. macrophylla* Goldie, described from Montreal. There can be no doubt as to the identity of *H. macrophylla*. Goldie compared it with *H. orbiculata*, its leaves said to be "four times as large as those of *H. orbiculata*, measuring from six to eight inches in length, very thin and pellucid . . . *Flowers* large, white, . . . and arranged in a lax spike of about five or six inches in length . . . *labellum* . . . linear, as long as the germen . . . *Germen* about an inch in length." A very illuminating review of early misidentifications of *H. macrophylla* and *H. orbiculata*, with beautiful drawings of the flowers of the two, was published by Ames in Rhodora, viii. 1–5 with figs. (1906). After his most careful discussion Ames gave the measurements of the spurs of *H. orbiculata* (ranging from 16 to 27, most often 18–20 mm. long) and of *H. macrophylla* (ranging from 32 to 43, most often 35–37 mm. long); while the type of "*Platanthera Menziesii* is the short-spurred form of *H. orbiculata*". With such a careful study at hand, it is unfortunate that *H. macrophylla* (our t. 1158, figs. 3 and 4, × 1) and *H. orbiculata* (our t. 1158, figs. 1 and 2, × 1) should still be confused. The inclusion of *H. macrophylla* by Abrams in his Ill. Fl. Pacific States, i. 477 (1940) in the synonymy of the carefully illustrated *Lysias orbiculata* (his fig. 1168) may account for his "Scape short, 3–6 dm. high". At least, the material of the northwestern plant illustrated by him (our *H. orbiculata*, var. *Menziesii*) in the Gray Herbarium shows scapes only 1–2 dm. high, while the scape of typical *H. orbiculata* rarely reaches a height of 5 dm.[1]

Although *Habenaria macrophylla* and typical *H. orbiculata* are both woodland plants, they rarely, if ever, grow together. In the Gray Herbarium and that of the New England Botanical Club there are 135 collections from eastern Canada (Quebec

[1] Through the dates of publication given by Abrams (1826 for Pursh's basic *Orchis rotundifolia*, 1822 for Goldie's *Habenaria macrophylla*) one would infer that the latter name has priority. By correcting the Pursh date to 1814 this difficulty is removed.

Photo. B. G. Schubert

HABENARIA ORBICULATA (var. TYPICA): FIG. 1, flowering inflorescence, × 1, from New Hampshire; FIG. 2, fruit, × 1, from New Hampshire.

H. MACROPHYLLA: FIG. 3, unusually small inflorescence, × 1, from Vermont; FIG. 4, fruit, × 1, from Maine.

eastward and southward) and northern New England of these two species. A listing of all localities shows only 7 cases in which both species have been collected in the same township or similar large area. This is well illustrated in Newfoundland, where variations of *H. orbiculata* occur on the western side of the Island and near the southern coast west of the Avalon Peninsula; but only *H. macrophylla* is known from the Avalon Peninsula. Furthermore, in general *H. macrophylla* occurs more often in richer soil than does *H. orbiculata:* such statements of habitat as "woods" or "damp" or "dry woods" are not distinctive but many labels of *H. macrophylla* indicate "deep rich woods", "hardwoods", "rich deciduous woods", "old mixed woods", "old maple-grove", etc., specifications rarely found on labels of *H. orbiculata.* As supplemental to the characters usually recognized as distinguishing *H. macrophylla,* I find that its full-grown capsules (our FIG. 4) range from 1.8–2.5 cm. long, with a thickness of 6–8 mm.; those of *H. orbiculata* (FIG. 2) 1.3–2 cm. long and 4–6 mm. thick.

EXPLANATION OF PLATES

PLATE 1157, all figs. × 1. FIGS. 1 and 2, racemes of HABENARIA ORBICULATA (Pursh) Torr., var. LEHORSII Fernald: FIG. 1 from TYPE; FIG. 2 from TOPOTYPE. FIGS. 3 and 4, H. ORBICULATA passing into var. LEHORSII: FIG. 3 from turf of *Scirpus caespitosus* L., var. *callosus* Bigel. and in *Sphagnum,* wet peaty bog-barrens at 400–550 m. alt., tableland of Lookout Mountain, Bonne Bay, Newfoundland, *Fernald, Long & Fogg,* no. 1554; FIG. 4, fruit, sphagnous boggy marsh, French (or Tweed) Island, Bay of Islands, Newfoundland, *Fernald, Long & Fogg,* no. 196. FIG. 5, raceme of H. ORBICULATA, var. MENZIESII (Lindl.) Fernald from Big Fork, Flathead Lake and vicinity, Montana, July 15, 1908, *Mrs. Joseph Clemens.*

PLATE 1158, all figs. × 1. FIGS. 1 and 2, portions of racemes of HABENARIA ORBICULATA, var. TYPICA: FIG. 1, flowers from Whitefield, New Hampshire, July 28, 1895, *Walter Deane;* FIG. 2, fruits from Franconia, New Hampshire, September 24, 1895, *E. & C. E. Faxon.* FIGS. 3 and 4, H. MACROPHYLLA Goldie: FIG. 3, unusually small raceme from Willoughby, Vermont, July 14, 1898, *G. G. Kennedy;* FIG. 4, fruits, Douglas Hill, Sebago, Maine, *Fernald, Long & Norton,* no. 13,318.

II. A SOUTHEASTERN NUPHAR (Plates 1159 and 1160)

NUPHAR **puteorum,** n. sp.[1] TAB. 1159 et TAB. 1160, FIG. 1–6. Similar to *N. ovatum* (Miller & Standley) Standley, but leaf-blades usually more tapering to apex, sparsely and minutely silky-puberulent beneath, the sinus 2–4 cm. broad near the middle, petiole subterete, densely puberulent; fruit 2.5–3.8 cm.

[1] NUPHAR **puteorum,** sp. nov., a *N. ovato* differt foliis ad apicem plus ovato-attenuatis, sinu latiore (medio 2–4 cm. lato); fructibus 2.3–3.5 cm. diametro; disco 1.3–1.5 cm. diametro, margine valde undulato, centro plerumque papillifero; seminibus quadrato-obovatis 4–5 mm. longis dorso puberulis.

high, 2.3–3.5 cm. thick, obscurely ribbed; rim of disk undulate, 1.3–1.5 cm. in diameter; disk deeply depressed, the center usually papillate; rays extending nearly to margin of disk; seeds quadrate-obovate, 4–5 mm. high, puberulent, at least on the back.—Sussex County, Virginia: deep muddy pit at margin of Chappell's Mill-pond (Honey Pond), west of Lumberton, July 3, 1942, *Fernald & Long*, no. 14,326 (type in Herb. Gray.; isotype in Herb. Phil. Acad.).

Nuphar puteorum occupied the center of a deep pit dug at the margin of Chappell's (or Honey) Pond. The very slippery and muddy border of the pit was so treacherous that we were able, with the aid of forked branches of trees, to pull ashore only a few broken-off flowering and fruiting stalks and some characteristic leaves. So treacherous was the footing and so indefinite the possible depth of the pit that we planned to return with a strong rope, as a safeguard, and secure better material, a responsibility now left to others. Hence the specific name, from *puteus*, a pit (not from *puteo*, to stink, although, after our half-drowning and unsavory experience from marsh-fumes in getting it, we inclined toward the latter source of the specific name).

Nuphar puteorum apparently belongs in the extreme southern and southwestern series of species with the lower leaf-surface more or less puberulent; and, judging from the monograph by Gerrit S. Miller & Paul C. Standley, *North American Species of Nymphaea*, Contrib. U. S. Nat. Herb. xvi³. (1912), it is nearest allied to the Texan *Nuphar ovatum* (Mill. & Standl.) Standl. From that monograph some details (our t. 1160, figs. 7 and 8) are here reproduced. The leaf-blade of *N. puteorum* is more ovate than that of *N. ovatum* and its sinus broader, 2–4 cm. across at the middle, the narrow sinus of *N. ovatum* shown as only one-tenth that breadth. The fruit (fig. 7) of the latter species is 3–4 cm. in diameter and with an entire summit-rim 2.8–4 cm. across; whereas the fruit (t. 1159, fig. 2) of the Virginian plant is 2.2–3.5 cm. in diameter and with the strongly scalloped or undulate rim only 1.3–1.5 cm. across. The depressed stigmatic disk (t. 1160, fig. 8) of the Texan plant is entire, 2.2–3 cm. across and with a smooth center, its rays failing by 2–4 mm. to reach the margin; the strongly undulate-margined disk (figs. 3 and 4, × 3) of *N. puteorum* is at most 1.5 cm. in diameter and its center often bears 1 to several papillae which resemble short stigmatic rays; and the rays extend

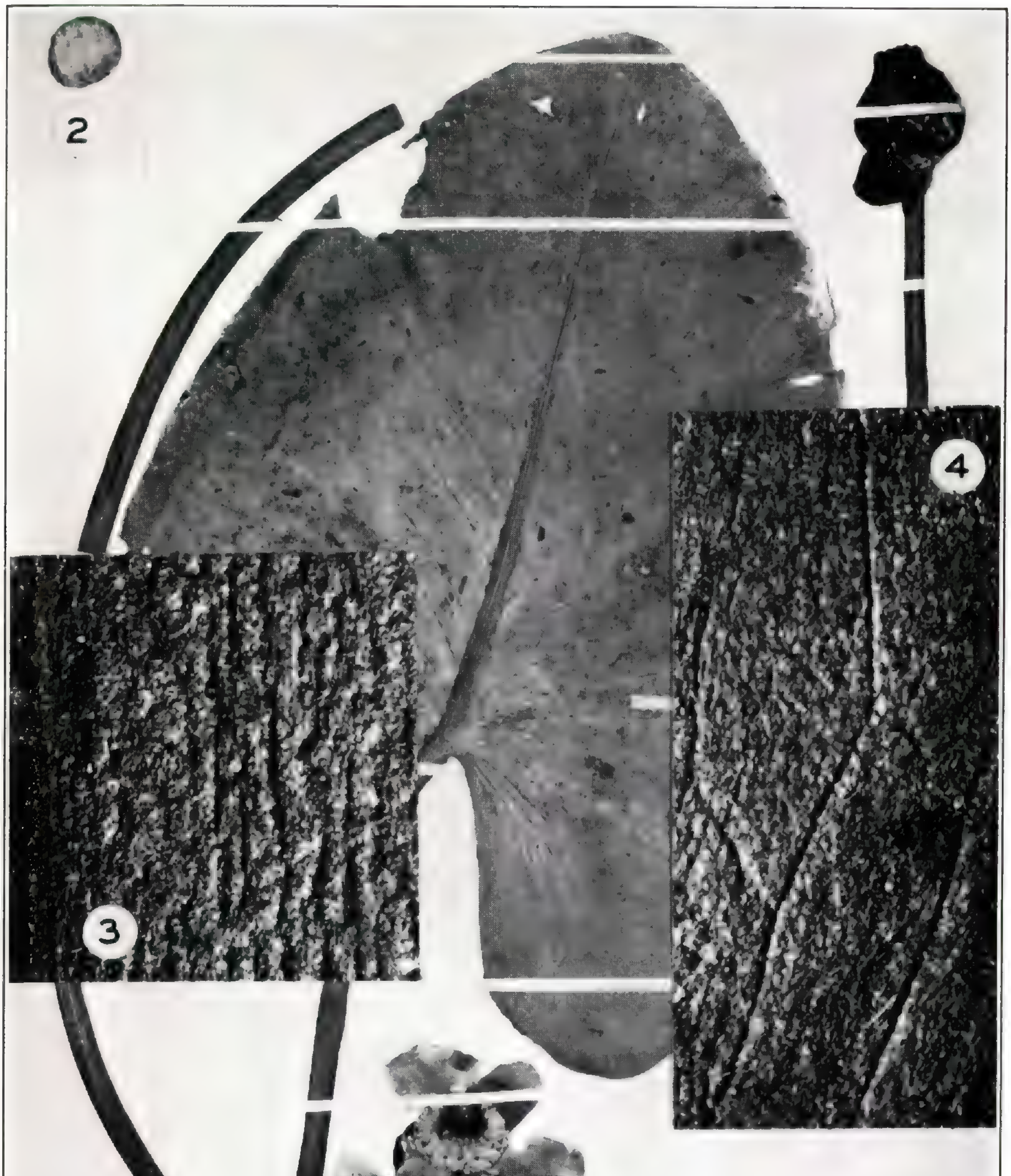

Photo. B. G. Schubert

NUPHAR PUTEORUM (all figs. from TYPE): FIG. 1, leaf, flower and fruit, × ca. ⅓; FIG. 2, cross-section of petiole, × 1; FIG. 3, surface of petiole, to show pubescence, × 5; FIG. 4, lower surface of leaf, with minute pubescence, × 5.

nearly to the margin of the disk. The seeds (FIG. 9) of *N. ovatum* are 3.5–4 mm. long, 3 mm. in diamerer, ovoid to obovoid and lustrously glabrous; those of the Virginian plant (FIG. 5) strongly quadrate-obovate, 4–5 mm. high and puberulent and dull at least on the back (FIG. 6, ×5), a character which is apparently unique in the genus.

The only other species with which *Nuphar puteorum* might be confused is *N. variegatum* Engelm., the wide-ranging northern species also with floating leaves. But, although the petioles and peduncles may be puberulent, they are conspicuously flattened and the lower leaf-surface is glabrous. Its capsules are corrugated above and with nearly entire summit-rim, and its seeds are relatively slender and lustrous. The newly defined species is a quite different plant and is to be expected farther south, especially near the inner margin of the Coastal Plain.

EXPLANATION OF PLATES 1159 and 1160

PLATE 1159. NUPHAR PUTEORUM, all figs from the TYPE: FIG. 1, leaf, flower and fruit, × ca. ⅓; FIG. 2, cross-section of petiole, × 1; FIG. 3, surface of petiole, to show pubescence, × 5; FIG. 4, lower surface of leaf, with minute pubescence, × 5.

PLATE 1160. FIGS. 1–6, from TYPE of NUPHAR PUTEORUM: FIG. 1, flower laid open, × 1; FIG. 2, capsule, × 1; FIGS. 3 and 4, disks, to show rays, center and undulate margin, × 3; FIG. 5, opaque seeds, × 1; FIG. 6, seeds, showing felted surface, × 5. FIGS. 7–9, N. OVATUM (Mill. & Standl.) Standl.: FIG. 7, larger of the fruits shown by Miller & Standley, × 1; FIG. 8, diagram of disk and rays, × 1, after Miller & Standley; FIG. 9, lustrous and glabrous seeds, × 1, from Driscoll Lake, Camp Fannin, 8 miles northeast of Tyler, Smith County, Texas, *H. E. Moore*, no. 993, as *N. advena* (Ait.) Ait. f.

III. A SOUTHERN AMELANCHIER

AMELANCHIER CANADENSIS (L.) Medic., var. **subintegra,** var. nov., frutex fastigiatus ad 3 vel 4 m. altus; foliis oblongo-ellipticis deinde subcoriaceis integris vel subintegris.—Damp sandy pine-barrens, southeastern VIRGINIA: south of Zuni, Isle of Wight County, July 4, 1942, *Fernald & Long*, no. 14,338; south of Lee's Mill, Isle of Wight Co., October 16, 1941, *Fernald & Long*, no. 13,949, and April 21, 1942 (in anthesis), *Fernald, Long & Abbe*, no. 14,177; east of Cox Landing, south of South Quay, Nansemond County, July 26 and 28, 1939, *Fernald & Long*, no. 10,670; northeast and east of Cox Landing, June 8, 1940, *Fernald & Long*, no. 12,095 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

Throughout the pine-barrens of Isle of Wight and Nansemond Counties var. *subintegra* is a characteristic tall fastigiate shrub of the wet depressions and damp thickets. In flower and foliage it is like typical and wide-ranging *Amelanchier canadensis* (rang-

ing from Georgia to southeastern and central Maine, central New Hampshire, southwestern Quebec and central-western New York. Typical *A. canadensis*, however, has the margins of the leaves regularly serrate nearly to base, with 6–11 sharp teeth, with acute sinuses, per cm. of margin. Var. *subintegra* at once attracts notice because of the quite entire or only apically slightly toothed leaves. It is consistent in the depressions of the pine-barrens throughout its area and doubtless crosses into eastern North Carolina. In all flowering material seen the young fruits are blasted; consequently no mature fruit has yet been found.

IV. The Autumnal Perennial Gentian of the Desert

In his scholarly Plants of Southern New Jersey, the late Dr. Witmer Stone wrote of the very distinct Pine-barren Gentian, the plant which has long passed as *Gentiana porphyrio* J. F. Gmelin, Syst. ii. 462 (1791):

> It is probably a matter of individual preference to determine which gentian is the handsomest. The present species, found only in the remote sections of the Pine Barrens, is certainly the least known and to my mind as handsome as any. Its flaring mouth, the delicate markings within, and the intensity of the blue, make it one of the choicest blooms of the region.
>
> It was apparently first discovered by William Bartram, who sent a drawing of it to Edwards, the British naturalist, who published it in his Gleanings of Natural History, vol. V., p. 98, 1758, as the "Autumnal Perennial Gentian of the Desert," but it was not properly named until 1791, and then from the Pine Barrens of South Carolina.—Stone, l. c. 640, 641 (1912).

The plate of William Bartram's plant and his brief description of it are unequivocal. The plate, in color, contained, in the style of Mark Catesby, a bird and a plant, these called on p. 97, under Edwards's Chapter xlv, Plate 255, "*The* Yellow-rumped Fly-catcher and *The* Gentian of the Desert", although beneath the plate itself Edwards's inscription reads "*The Autumnal Gentian of the Desert*". As stated by Stone, Edwards had the plant from William Bartram and he showed it primarily as an attractive perch for the fly-catcher, saying (p. 98):

> I received this bird, preserved dry, from Mr. William Bartram, of Pensylvania, with a drawing of the Gentian only, which I have added to it rather as a decoration, than a part of this Natural History; but nevertheless I shall give Mr. Bartram's account of it. He calls it the Autumnal Perennial Gentian of the Desert, and says, that it produces three or four stalks from one root, each of about a foot high, and some stalks produce two flowers: the flowers are of a fine blue colour: the

stalks and leaves green: the flowers keep long in their beauty, and the roots live many years: they are scarce in Pensylvania. Catesby, in his History of Carolina, vol. I. pag. 70, has given a different species of the American Gentian.

Bartram's description is quite as satisfactory as are many of Catesby or other pre-Linnaean and early post-Linnaean or even Linnaean ones, but until very recently it was not realized that Linnaeus in 1776 gave a name to the plant of Bartram, this antedating by 15 years the name given by Gmelin. The matter is clearly stated by Dr. W. L. McAtee who, in March, 1949, privately issued a 1-page announcement under the title, A LINNAEAN PAPER NEEDING FURTHER ATTENTION. His first paragraph reads:

> Near the end of his career, at the request of a London publisher (Jacob Robson), Linnaeus prepared (or perhaps merely added Latin names to a base provided him) "A Catalogue of the Birds, Beasts, Fishes, Insects, Plants & contained in Edwards's Natural History, in Seven Volumes, with their Latin Names." This was printed by Robson in London, 1776, as a 15-page, crown-folio pamphlet in conjunction with "Some Memoirs of the Life and Works of George Edwards" (38 pp.), apparently of his own composition. Probably this "Catalogue" was also separately distributed and from a closing, "N.B.", it is evident that it was prepared as a supplement to Edwards's work, instructions being given as to placing its parts for binding.

The only other *Gentiana autumnalis* is an illegitimate one, although that fact is not brought out in *Index Kewensis*, and the Linnaean name has priority of nearly a century. I refer to *Gentiana autumnalis* Preyer & Zirkel ex Babington in Journ. Linn. Soc. xi. 318 (1871). The latter name was quite illegitimate, since, under the maintained *G. amarella* L., Babington simply remarked: "This is probably the G. autumnalis of P. & Z."

The essential bibliography is as follows:

GENTIANA AUTUMNALIS L. Cat. Edwards's Nat. Hist. 11 (1776), the name based on the plate and William Bartram's quoted description in Edwards, Gleanings Nat. Hist. v. 97, 98, t. 255 (1758). *G. angustifolia* Michx. Fl. Bor.-Am. i. 177 (1803), not Vill. (1787). *G. porphyrio* sensu authors, apparently not the restricted (as described) *G. porphyrio* of J. F. Gmel. (see below). *G. Stoneana* Fern. in RHODORA, xli. 555, t. 579 (1939). *G. porphyrio*, forma *Stoneana* (Fern.) Fern. in RHODORA, xliv. 152 (1942).

Forma **albocaerulea** (Fern.), comb. nov. *G. porphyrio*, forma *albocaerulea* Fern. in RHODORA, xliv. 152 (1942).

Forma **albescens** (Fern.), comb. nov. *G. porphyrio*, forma *albescens* Fern. l. c. (1942).

Forma **porphyrio** (J. F. Gmel.), stat. nov. *G. purpurea* Walt. Fl. Carol. 109 (1788), not L. (1753). *G. porphyrio* J. F. Gmel. Syst. ii. 462 (1791).

Gentiana purpurea Walt. was described under the heading, "Corollis infundibuliformibus" in the following words:

> *purpurea* 3. corollis intus laete purpureis; caule simplici, fol. linearibus

On account of the earlier *Gentiana purpurea*, J. F. Gmelin renamed Walter's plant, without knowing more than the original description, for the purple gallinules (*Porphyrio*), without a word of new description. In 1939, familiar with the intense blue of the corolla of the plant passing as *G. porphyrio* and well-knowing the truly purple color-variations of other southeastern gentians, I felt that, without any extant material of Walter's *G. purpurea*, there was very serious doubt about its identity. I, therefore, named the Pine-barren Gentian with intensely azure corolla and the tube often brown-mottled within *G. Stoneana*. In Rhodora, xliv. 152 (1942), however, accepting the statement of Dr. R. T. Clausen in Bull. Torr. Bot. Cl. lxviii. 662 (1941), that he had seen "plants" of the "pink phase" which "came originally from near Wilmington, North Carolina", where found by Mrs. J. Norman Henry; and, having seen a specimen with "lavender" flower from New Jersey, I took up the specific name *G. porphyrio*. Somewhat later, in Rhodora, l. c. 238 (1942), quoting the discoverer, I pointed out that the "plants" found by her "after a long and careful search" were a single individual which she removed to her garden and subsequently divided. Bartram originally said "the flowers are of a fine blue colour"; Michaux described his *Gentiana angustifolia* with "Corolla magna, coerulea"; Elliott (Sk. i. 344) said "bright azure"; Chapman (Fl. 356) said "bright blue"; Small (Fl. 931) said "deep or brilliant azure-blue"; Stone (Pl. So. N. J. 640) speaks of the "intensity of the blue"; and Mrs. Henry, in the letter above quoted, said "In 1938 I ran across a large area that was dotted liberally with *Gentiana porphyrio*—the common blue type. As is my custom on finding a large group of any plant, I began to search for an albino. I had no luck . . . but I did find the pink . . . A long and careful search

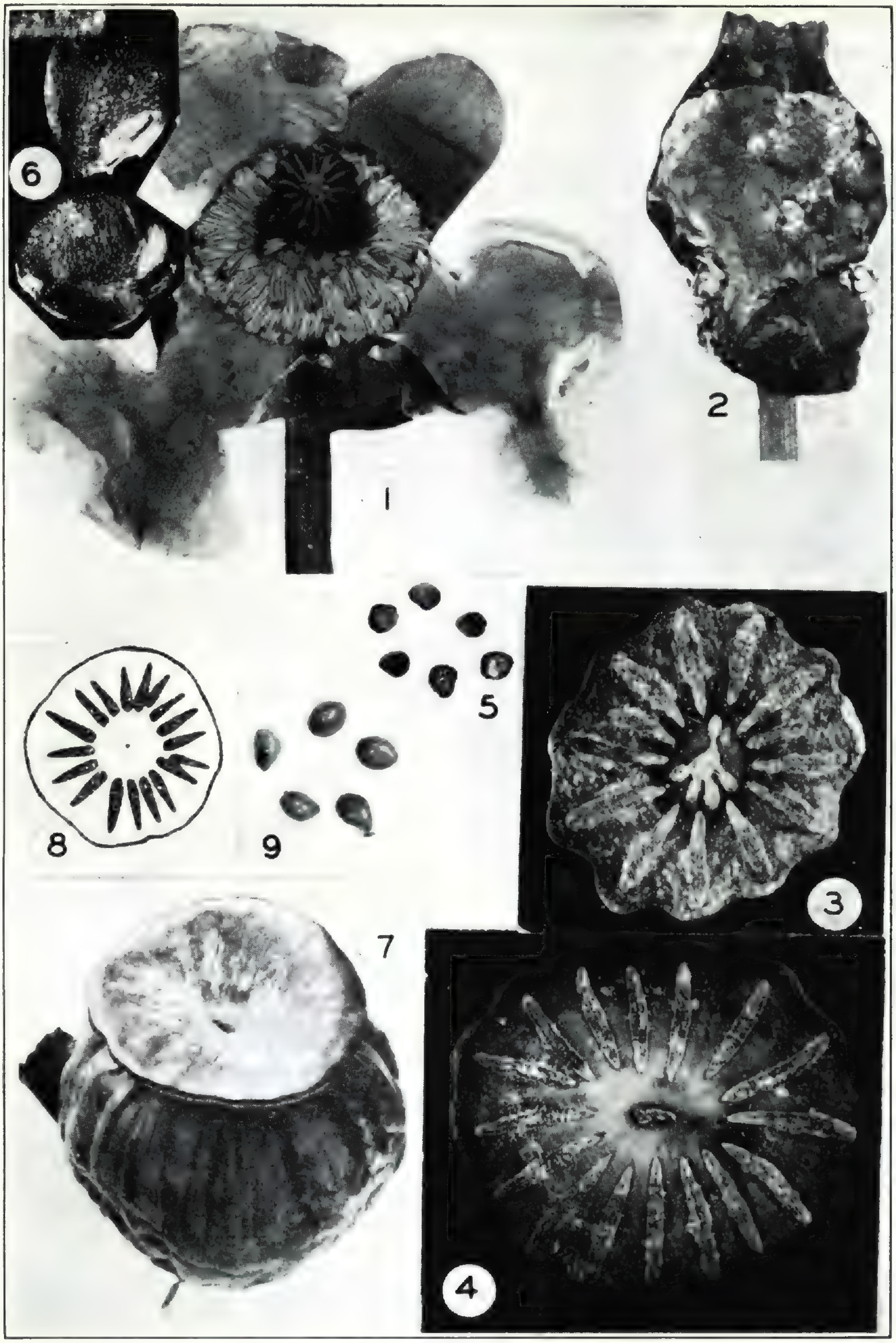

Photo. B. G. Schubert

NUPHAR PUTEORUM (all figs. from type): FIG. 1, flower laid open, × 1; FIG. 2, capsule, × 1; FIGS. 3 and 4, disks, × 3; FIG. 5, opaque seeds, × 1; FIG. 6, seeds, showing felted surface, × 5.

N. OVATUM: FIG. 7, fruit, × 1, after *Miller & Standley;* FIG. 8, diagram of disk, × 1, after *Miller & Standley;* FIG. 9, lustrous and glabrous seeds, × 1, from Smith County, Texas.

revealed that this was the only one of its color. There were no intermediate shades. . . . It has been growing in a pot in a cold frame ever since. This spring [1942] . . . I ventured to divide it in two". To this I added: "It is evident that I was in error in referring to Mrs. Henry's having found 'plants' with pink flowers". It is further evident, if Walter's *Gentiana purpurea* were accurately named and described, that he had the remarkable experience of finding a very rare color-form, without giving evidence that he saw the usual azure-flowered plant.

At any rate, the proper naming of the latter plant from a colored plate and sufficient description of it as *Gentiana autumnalis* L. (1776) allows us to use for it a wholly appropriate name.

V. Three Minor Transfers

In order to make them available for use the following transfers are necessary.

Erianthus giganteus (Walt.) Muhl., var. **compactus** (Nash), comb. nov. *E. compactus* Nash in Bull. Torr. Bot. Cl. xxii. 419 (1895). *E. saccharoides* Michx., var. *compactus* (Nash) Fern. in Rhodora, xlv. 252 (1943).

Malaxis brachypoda (Gray) Fernald, forma **bifolia** (Mousley), comb. nov. *M. monophyllos* (L.) Sw., forma *bifolia* Mousley in Orchid Rev. xxxv. 356, fig. (1927).

Rubus idaeus L., var. **caudatus** (Robinson & Schrenk), comb. nov. *R. strigosus* Michx., var. *caudatus* Robinson & Schrenk in Can. Rec. Sci. vii. 14 (1896).

Arenaria uniflora.—In Rhodora, l. 195–197, t. 1103 (1948), we showed that *Stellaria uniflora* Walt. Fl. Carol. 141 (1788) had been generally misinterpreted and that Walter's specimen as well as diagnosis showed it to be identical with *Arenaria brevifolia* Nutt. ex Torr. & Gray, Fl. N. Am. i. 180 (1838).

On account of the different *A. uniflora* Luce (1823) we decided that Nuttall's name must stand under *Arenaria.* We are indebted to Dr. Bassett Maguire for calling to our attention the fact that Muhlenberg, Cat. 45 (1813) properly made the transfer of Walter's binomial to *Arenaria.* Muhlenberg gave (perhaps fortunately, since Walter's species has been so generally misinterpreted) no discussion, merely, under Arenaria

alb.	8. uniflora Stellaria Walt.	} one-flowered

It is, therefore, evident that we must replace *Arenaria brevifolia* Nutt. ex Torr. & Gray (1838) by *A. uniflora* (Walt.) Muhl. (1813).—M. L. Fernald and B. G. Schubert.

NOMENCLATURAL AND OTHER NOTES ON MOSSES

Herbert Habeeb

For a number of years the writer has been collecting and studying North American mosses. Although the mosses of the region have received an excellent and exhaustive treatment in Dr. A. J. Grout's *Moss Flora of North America North of Mexico*, some problems still exist; and in the following discussion the author hopes to clarify a few, or at least to bring them to the consideration of others.

Pylaisia Bry. Eur. fasc. **46–47** (1851).

Pylaisia Bry. Eur. is a later homonym of the orthographic variant *Pilaisaea* Desvaux, Jour. Bot. **5:** 24 (1814) (1813?). It would, therefore, seem desirable to include it on the list of *nomina generica conservanda proposita* for the *Musci*.

Pylaisia polyantha Bry. Eur., var. **Jamesii** (Sull. & Lesq.), comb. nov. *Pylaisia Jamesii* Sull. & Lesq. *Schedae ad* Musci Bor. Am. Ed. **2:** 63 (1865). *Pylaisiella polyantha Jamesii* (Sull.) E. G. B. Bull. Torrey Club **23:** 230 (1896).

I agree with Mrs. E. G. Britton's allocation of a varietal status to *P. Jamesii*, I find that the chief distinguishing character, number of quadrate alar cells present on the leaves, proves to be a variable one, sometimes on leaves from the same plant. In our locality plants closest to *P. polyantha*, having leaves with relatively few quadrate alar cells, usually grow on rock-ledge; while plants of the var. *Jamesii*, having numerous quadrate alar cells on the leaves, grow on trees.

Thelia asprella Sull., var. **Lescurii** (Sull.), stat. nov. *Thelia Lescurii* Sull. Mosses U. S. 60 (1856); Sull. in Sull. & Lesq. *Schedae ad* Musci Bor. Am. Ed. **1:** 54 (1856).

Here the differences, namely relative degree of marginal ciliation in the leaves and the habitat, separating *Thelia asprella*

from *Thelia Lescurii* are not, in my opinion, of specific rank. In this case it would seem that the degree of marginal ciliation in the leaves is associated with the habitat.

DICRANUM SCOPARIUM Hedw., forma **alatum** (Barnes apud Röll), stat. et comb. nov. *Dicranum Bonjeani* DeNot., var. *alatum* Barnes apud Röll, Bot. Centralb. **44:** 386 (1890); *Separat-Abdruck* 2 (1890). *D. alatum* Grout, Moss Flora N. Am. **1:** 88 (1937). *D. scoparium* approaching *Bonjeani* or *D. Bonjeani* approaching *scoparium* on herbarium specimens, various authors.

The plants here placed occur much more commonly in the Northeast than either typical *D. scoparium* or typical *D. Bonjeani*. *D. Bonjeani* being admittedly a subspecies (whatever that is in the study of *Musci*) of *D. scoparium*, I see no reason why the intermediate form should be kept under *D. Bonjeani*.

FISSIDENS ADIANTHOIDES Hedw., forma **immarginatus** (Lindb. apud Lesq. & James), stat. nov. *Fissidens adiantoides* Hedw., var. *immarginatus* Lindb. apud Lesq. & James, Man. Mosses N. Am. 88 (1884). *Fissidens adiantoides* Hedw., (var. *immarginatus*) Barnes, Bot. Gaz. **12:** 27 (1887).

Though the character of no perceptible border even at times does not hold for all of the leaves on an individual plant, the student will find it occasionally convenient to name a specimen forma *immarginatus*. Hedwig, in the Species Muscorum, 1801, the starting point for nomenclature in the *Musci*, spells the specific name "*adianthoides*" not "adiantoides".

CAMPTOTHECIUM NUTTALLII (Wils.) Bry. Eur. ex Macoun, Cat. Can. Plants **6:** 188 (1892).

Students wishing to use the name, *Camptothecium Nuttallii*, will have to cite it as shown or in some other form, for the combination was not made in the Bryolgia Europaea. It was only indicated by a reference of the name, *Hypnum Nuttallii* Wils., to the new genus, *Camptothecium*. Sullivant, Lesquereux and James, and others made the combination, but only in synonymy. Their combinations are not valid according to article 40 of the International Rules of Botanical Nomenclature. Although Grout, in the Moss Flora of North America, wrote *Homalothecium Nuttallii* (Wils.) Grout, the combination was made earlier and should be given as *Homalothecium Nuttallii* (Wils.) Jaeger & Sauerbeck, Adumbratio **2:** 376 (1876–77).

Plagiopus Oederi (Brid.) Limpr., forma **alpinus** (Schwaegr.), stat. et comb. nov. *Bartramia Oederi*, β. var. *alpina* Schwaegr. Species Muscorum Suppl. **1:** 2: 50 (1816). *B. Oederi*, β. var. *condensata* Brid. Musc. Rec. Suppl. **3:** 87 (1817). *Plagiopus serratus* Brid. Bry. Univ. **1:** 596 (1826). *Plagiopus Oederi*, var. *condensatus* Limpr. Deutschl. Laubm. **2:** 550 (1893).

This form, condensed by a xerophytic habitat, has been collected by the writer from the canyon at Grand Falls, New Brunswick.

This is also an amusing case. For Bridel, in his Bryologia Universa, described as a new genus and species, *Plagiopus serratus* and yet maintained *Bartramia Oederi*, var. *condensata* in this same publication. Later authors showed the former to be synonymous with the latter (see Paris, Index Bryologicus Ed. 1). Recent authors segregate from *Bartramia* the species *Plagiopus Oederi* (Brid.) Limpr. And, Grout, in the Moss Flora of North America, gives *Plagiopus serratus* Brid. as the type-species of the genus, *Plagiopus*. So, we end up with a synonym acting as a type-species. I, therefore, propose that *Plagiopus Oederi* (Brid.) Limpr. be taken up as the type-species of the genus, *Plagiopus*.

Ditrichum flexicaule (Schwaegr.) Hampe, forma **Estellae,** forma nova. Plantae parvulae caespitosae; caulibus superne flagelliformis cum foliis minimis.—Plants small, crowded; upper stem-parts forming long, slender, brittle, flagellae with reduced leaves.—New Brunswick: Grand Falls, ledges in canyon, *Habeeb* 286, May 5, 1944.

This is an extremely reduced form growing in exposed ledge-cracks that are flooded at high water. The plants each year push out new flagellae which are in turn swept away.

Grimmia apocarpa Hedw., var. alpicola (Hedw.) Hartm., forma **papillosa** (Jones apud Grout), comb. nov. *Grimmia alpicola* Hedw., var. *rivularis* (Brid.) Broth., forma *papillosa* Jones apud Grout, Moss Flora N. Am. **2:** 14 (1933).

I must say that I agree with Dr. Geneva Sayre's views in her discussion of *Grimmia alpicola* Hedw. in the Bryologist **49:** 3–7 (1946). Here, she supports a varietal rank for *G. alpicola*. Yet, this leaves forma *papillosa* "in the air", so to speak—hence the above combination. From specimens named by Dr. Grout and the description itself, it is hard to see why in the first place forma *papillosa* was under var. *rivularis*, as it is more closely

related to typical *G. alpicola*, from which it differs only in the extreme papillation of the costa and leaf towards the leaf-apex.

Grimmia Wrightii (Sull.) Aust., var. **Rauei** (Aust.), stat. nov. *Grimmia* (*coscinodon*) *Rauei* Aust. Bull. Torrey Club **6:** 46 (1875). *Coscinodon Raui* (Aust.) Lesq. & James, Man. Mosses N. Am. 155 (1884).

The chief difference between the species and variety is the erose denticulation of the upper leaf-margin found in *G. Wrightii* and margins nearly entire in *G. Rauei*. Again a variable character.

Grimmia Doniana Sm. Flora Brit. **3:** 1198 (1804).

By such specimens, descriptions and plates (see the Bryologia Europaea plates 249, 250, 251) as have been seen, and allowing for a little variation in capsule-lids and basal leaf-cells, I cannot separate *Grimmia montana* Bry. Eur. and *Grimmia alpestris* Nees from *Grimmia Doniana*. It could be that I lack the *grim* judgement of a *Grimmia* specialist, as I fail to see much difference between a calyptra of several near equal slits, said to be mitriform, and a calyptra of several slits with one slit longer than the others, said to be cucullate.

Grand Falls, New Brunswick

Holcus mollis in New Hampshire.—An unfamiliar grass collected by me on 19 July, 1949, in low ground by the Maine Central Railroad in Columbia, N. H., precisely matches herbarium specimens and the description in A. S. Hitchcock's *Manual of the Grasses of the United States* (1935), 301 (and fig. 595), of *Holcus mollis* L. (*Ginannia mollis* (L.) Bubani), a species recently adventive from Europe. Hitchcock records its occurrences in America as reaching from Washington to California, with stations also reported from Lewis County, N. Y., and on ballast at Camden, N. J. The Gray Herbarium and the herbarium of the New England Botanical Club show no previously collected specimens from the Eastern United States. This species has panicles rather smaller than those of *H. lanatus*, and the awn of its second floret is exserted and geniculate, instead of hook-like as in *H. lanatus*.—Arthur Stanley Pease, Harvard University.

A New Flora for the San Francisco Bay Area[1]—One of the delights and compensations of the systematic botanist is his enforced intimate contacts with living dynamic populations of plants while studying them in their wild settings. In Marin Flora, Howell conveys to the reader a certain sense of the enjoyment he must have experienced while tramping the Marin hills gathering first hand information about the plants growing there. This book is an account of the plants growing in a single county comprising 529 square miles, but it should be usable in a much larger area of central coastal California. It is based upon an intensive study carried on for more than a ten-year period by its author. However, as is usual in systematics, it reflects the work of several contemporary botanists and many botanists of preceding generations.

Following a description of the physiographic features of Marin County, a section of the book is devoted to "life zones and plant associations". Here the thoughtful student may gain some precise information about the kinds of plants found growing together in various areas and habitats of the region covered. Also included are twenty-four remarkably clear photographs taken by Charles T. Townsend of a varitey of views and plants. Howell distinguishes about a dozen plant associations and discusses them under the headings: redwood forest, tanbark oak-madroño forest, oak-buckeye forest, Douglas fir forest, Bishop pine forest, chaparral, coastal brush, coastal grassland, hill and valley grassland, mountain meadow, serpentine grassland, vernal pools, streambank plants, lakeshore plants, freshwater marshes, salt marshes, dunes and beaches.

The major portion of the book is devoted to keys for identifying Marin County plants and to their enumeration. The nomenclature is commendably conservative. Useful notes and localities where a given species has been found are given under each. An appropriately abbreviated glossary and index, together with maps of the county and of Mt. Tamalpais, are appended to the main work. Marin Flora should prove to be particularly useful to botanists, amateur and professional alike, in the San Francisco Bay area.—R. C. Rollins.

[1] Marin Flora: Manual of the Flowering Plants and Ferns of Marin County, California, by John Thomas Howell. VII + 323 pp. with 25 plates and 2 maps. $4.50, University of California Press. 1949.

Volume 52, no. 615, including pages 49–60, was issued 17 March, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. May, 1950. No. 617.

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The New England Botanical Club, Inc.

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Botanical Museum, Oxford St., Cambridge 38, Mass.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

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EIGHT WEST KING ST., LANCASTER, PA.

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Figs. 1 and 2. Cladonia farinacea. Fig. 3. Cladonia cylindrica.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. **May, 1950** **No. 617**

NOTES ON THE CLADONIAE OF CONNECTICUT—IV[1]

ALEXANDER W. EVANS

(Plate 1161)

THE writer's first report on the *Cladoniae* of Connecticut, which was published in 1930, was based on collections made down to the close of 1928. This report was followed by three series of Notes, published in 1932, 1935, and 1938, respectively, and by a Supplementary Report, published in 1944, which brought the record of explorations down to the close of 1943. The present article brings the record down to the close of 1949.

In the Supplementary Report emphasis was laid on the lichen-substances found in the various species and on the demonstration of these substances by means of Asahina's microchemical methods. The data included were based in part on Asahina's publications and in part on independent investigations. Unfortunately several papers on the chemistry of *Cladonia*, published by Asahina during the years 1941, 1942, and 1943, were unknown to the writer at that time but have since become available. These papers deal with numerous species found in Connecticut and were based in part on North American specimens from the herbarium of Yale University. Some of the specimens in fact had been collected in Connecticut. The writer's Supplementary Report thus duplicates the earlier studies of Asahina to a certain extent, and if the observations on the species occurring in Connecticut are compared they will be found to be in essential agreement. The few cases in which there are slight discrepancies will be discussed in the following pages.

[1] CONTRIBUTION FROM THE OSBORN BOTANICAL LABORATORY.

The names of most of the collectors mentioned in the present paper have already been cited by the writer in his earlier publications on the *Cladoniae* of the state. The following collectors, however, who are cited under individual species, have not previously been listed: S. C. Ball, J. H. Barnhart, P. R. Burkholder, H. S. Clark, M. E. Hale, Jr., Miss M. Kincaid, Mr. and Mrs. W. A. Miner, E. W. Sinnott, D. M. Smith, D. Spencer, and Mrs. C. Spencer. Specimens collected by the writer are listed with dates only, and all other specimens are listed with dates and collectors' names. With rare exceptions, which will be especially noted, the specimens listed are preserved in the herbarium of Yale University.

The arrangement in Vainio's Monographia Universalis (1887, 1894) is again followed in the present paper, although certain inconsistencies in this arrangement are now recognized. Full synonymy is given in the case of species or forms listed for the first time from Connecticut or in the case of names that are different from those used in earlier reports.[2] In most cases, however, each name is followed merely by a date and a page-number, referring to one of the writer's articles cited in the bibliography.

Subgenus CLADINA

CLADONIA RANGIFERINA (L.) Web. (1930, p. 375). It has long been known that the lichen-substances in this species are fumarprotocetraric acid and atronorine. The podetia in consequence turn red with P[3] and yellow with K[3], but the color produced by the latter reagent may be obscured, owing to the large amount of fumarprotocetraric acid present. The atronorine, however, can readily be demonstrated by means of the G. A. o-T. solution. The following records are based on specimens which are indefinite as to form: Andover (1944), Bozrah (1945), Coventry (1948), Ellington (*Miner*, 1944), Granby (1949), Manchester (1945), Newtown (1944), Norfolk (1945), Preston (1946), Sprague (1945), Tolland (1944), and Waterbury (1945).

CLADONIA RANGIFERINA f. CRISPATA Coem. (1930, p. 377). Bloomfield (*Neale*, 1945), Cornwall (1945), Goshen (1949), Meriden (*Johnson*, 1945), Norfolk (*Hale*, 1949), Southington (*Bunn*, 1944), and Tolland (1944).

CLADONIA RANGIFERINA f. INCRASSATA Schaer. (1938, p. 7). Meriden (*Johnson*, 1948).

[2] These are designated by asterisks.

[3] The letter K is an abbreviation for an aqueous solution of potassium hydroxide; the letter P, for an alcoholic solution of paraphenylene-diamine.

CLADONIA RANGIFERINA f. PROLIFERA Flot. (1930, p. 377). Southington (*Bunn*, 1944) and Torrington (1944).

CLADONIA RANGIFERINA f. UMBELLATA Anders (1935, p. 35). Southington (*Bunn*, 1945), Torrington (1944), and Winchester (1946).

CLADONIA SYLVATICA (L.) Hoffm. (1930, p. 378). Usnic and fumarprotocetraric acids have long been considered normal components of *C. sylvatica*, and the latter substance is of course responsible for the bitter taste of the podetia and for the more or less definite red color produced by the addition of P. The P+ reaction, moreover, has been used to distinguish *C. sylvatica* from the closely related *C. mitis*, which is normally P−.

In 1941 Asahina published the results of his microchemical studies on *C. sylvatica* and *C. mitis* and reached conclusions some of which are at variance with the views usually held. His material of *C. sylvatica* included 84 numbers of Sandstede's *Cladoniae* Exsiccatae (81 from Europe and 3 from North America) and about a dozen specimens from eastern Asia, mostly from Japan. With the exception of No. 1209, which proved to be referable to *C. mitis*, Asahina reported that almost all ("fast alle") of Sandstede's specimens contained usnic and fumarprotocetraric acids. He reported also that rangiformic acid, a substance found in *C. mitis*, was lacking in *C. sylvatica*.

According to Asahina's account most of the Asiatic specimens agreed with those from Europe and North America in being P+ and in thus conforming to the usual conception of *C. sylvatica*. Three of the specimens from Japan, however, proved to be P− and he distinguished these as f. *inactiva*. He referred these specimens to *C. sylvatica*, rather than to *C. mitis*, on account of their dense branching and short internodes. He thus laid greater emphasis on morphological features than on chemical features in separating *C. sylvatica* from *C. mitis*. The results of Asahina's studies on the latter species will be discussed below.

In March, 1944, Braeden and his colleagues also published an account of the chemical substances found in *C. sylvatica*, based on an analysis of material collected in Ireland. They reported the presence of usnic acid in considerable amount and the probable presence of fumarprotocetraric acid in small amount. In addition to these they extracted a snow white crystalline substance, which they identified as ursolic acid. This substance was originally obtained from the leaves of *Arctostaphylos Uva*

Ursi but has since been found in a number of other phanerogams.

Independent observations on the chemical features of *C. sylvatica* were published by the writer in August, 1944, in ignorance of the earlier papers by Asahina and Braeden. In addition to usnic and fumarprotocetraric acids a colorless substance was reported. This substance in the G. E. solution deposits minute crystals in the form of needles or rods, usually arranged in dense circular clusters in which the elements radiate out from the center. Since these crystals could not be referred to any lichen-substance known to the writer they were provisionally designated by the letter E. Such crystals can readily be demonstrated in most specimens of *C. sylvatica*, although an occasional example fails to show them.

The question naturally arises whether crystals of the type E are referable to ursolic acid or represent a fourth constituent of the species. Through the cooperation of Dr. D. M. Bonner a sample of ursolic acid from the Eastern Regional Research Laboratory at Philadelphia has been available for study. This sample, which had been extracted from apple skins, consists of fairly large colorless crystals in the form of thin narrow plates with truncate ends. They appear at first sight different from crystals of the type "E". Dr. Asahina, however, to whom the matter was referred, suggested in a letter dated September 21, 1949, that crystals of ursolic acid be finely pulverized and then dissolved in acetone and treated with the G. E. solution in the usual way. By this method he obtained crystals in the form of "fine prisms or needles radiated or irregularly scattered" but was unable to obtain similar crystals from Japanese specimens of *C. sylvatica*.

The writer has followed Dr. Asahina's suggestions with pure ursolic acid and also with a mixture of ursolic acid and fragments of *C. submitis*, a species which lacks the substance E. In both cases crystals similar to those described by him made their appearance, and these crystals are essentially like the crystals of type E obtained from European and North American specimens of *C. sylvatica*. It seems justifiable, therefore, to consider the substance E and ursolic acid identical and to interpret this acid as a frequent accessory component of *C. sylvatica*.

The following records are based on specimens indefinite as to form: Bozrah (1945), Colebrook (1945), Cornwall (1944), Danbury (*Barnhart*, 1890, N. Y.), Ellington (1944), Hamden (1946), Lisbon (1947), Montville (1947), Newtown (1944), Norfolk (*Evans*, 1945; *Hale*, 1949), North Stonington (1946), Prospect (1949), Sharon (*Green*, 1884, Eckfeldt Herbarium, earliest record for town), Southbury (1949), Torrington (1944), Washington (1949), Wethersfield (1944), Woodbury (*Sinnott*, 1944), and Woodstock (*Kincaid & Neale*, 1947).

Cladonia sylvatica f. prolifera Sandst. (1930, p. 381). Norfolk (1945) and Salisbury (1948).

Cladonia sylvatica f. pygmaea Sandst. (1930, p. 381). Colchester (1947), Colebrook (*Hale*, 1947), Lisbon (1947), Meriden (*Johnson*, 1945), Norfolk (1945), Preston (1946), Southington (*Bunn*, 1943), and Tolland (1944).

Cladonia sylvatica f. sphagnoides (Floerke) Oliv. (1930, p. 380). Avon (1949) and Bozrah (1945).

*Cladonia sylvatica f. subspumosa Sandst. Clad. Exsic. 1061. 1923 (as modification); Bericht. Uebersicht 34. 1930 (as form). Southington (*Bunn*, 1945).

In this unusual form the branches are densely crowded in the apical portion of the podetia, and the ultimate branchlets are straight or nearly so, in many cases forming star-like whorls around open axils.

*Cladonia mitis Sandst. (1930, p. 381; 1944, p. 533).

The morphological differences between *C. mitis* and *C. sylvatica* are brought out by Sandstede in his original description of *C. mitis*, as well as in his later descriptions. The podetia in typical examples, according to his account, form rather loose branch-systems, the ultimate branchlets of which tend to diverge in various directions. In *C. sylvatica*, on the other hand, the podetia form denser branch-systems, the ultimate branchlets of which tend to curve in one direction. These differences are clearly shown in Sandstede's plates in Rabenhorst's Kryptogamen-Flora (1931, *pl. 3, f. 1, 2, 3, and 6* for *C. mitis*, and *pl. 2, f. 3 and 4* for *C. sylvatica*). He mentions also a slight difference in color, assigning a paler shade to *C. mitis* than to *C. sylvatica*. The morphological differences, although distinct in typical examples, are based on variable characters, and specimens are frequently met with which are difficult to determine on the basis of morphological features alone. In his delimitation of *C. mitis* Sandstede lays especial emphasis on the absence of a bitter taste in sepa-

rating the species from *C. sylvatica*, in which a bitter taste is more or less apparent. This difference in taste points to the absence of the bitter fumarprotocetraric acid in *C. mitis* and to the presence of this acid in *C. sylvatica*. In consequence of this difference *C. mitis* is normally P− and *C. sylvatica* P+. Sandstede, in fact, ascribes a greater importance to this chemical difference than to morphological differences in distinguishing between these two species. In 1938 he reported that Asahina had extracted both usnic and rangiformic acids from *C. mitis* (p. 91) but that the latter substance could not be demonstrated by microchemical methods.

In the same year Lamb (p. 160), in reporting *C. mitis* for the first time from the British Isles, showed that some of his specimens were not P− throughout, but that their ultimate branches turned yellow and then red upon the application of P. He added that the color was "never intense as in *C. sylvatica*" and concluded that the amount of [fumarprotocetraric] acid present was insufficient to give the podetia a bitter taste.

Des Abbayes in 1939 used the P− reaction in his key (p. 68) to distinguish *C. mitis* from the P+ *C. sylvatica* but modified this distinction by stating that P might produce slowly and in rare instances a yellow or pale red coloration. In his opinion (p. 124) *C. mitis* is not a mere chemical variation of *C. sylvatica* but represents a valid species. Although he regards the absence of fumarprotocetraric acid as the most important character separating *C. mitis* from *C. sylvatica* he maintains that in many cases the two species can be distinguished by morphological differences alone, such as those brought out by Sandstede.

In Asahina's account of *C. mitis* (1941, p. 623) he again shows that rangiformic acid represents a component of the species but this time describes characteristic crystals formed in the G. E. solution. His observations are based on 92 numbers of Sandstede's *Cladoniae* exsiccatae and on 12 specimens from Vermont and Connecticut. Sandstede's specimens include 81 from Europe and 11 from New England. Asahina here, as in the case of *C. sylvatica*, lays greater emphasis on morphological than on chemical features and includes under *C. mitis* 31 numbers of Sandstede's *Cladoniae* to which he assigns a P+ reaction. He demonstrated the presence of rangiformic acid in 14 of these but

was unable to do so in the others. As a result of his studies he reached the conclusion that a difference in reaction with P can no longer be trusted in separating *C. mitis* from *C. sylvatica.*

In 1943 the writer published the results of his independent microchemical studies on *C. mitis*, based on 83 numbers of Sandstede's *Cladoniae* exsiccatae and on numerous other specimens from Europe and North America. Sandstede's material included most of the numbers studied by Asahina. In nearly half of these various specimens usnic acid was the only substance demonstrated. The others yielded in addition crystals of four unknown substances, designated by the letters A, B, C, and D. These substances occurred singly or in various combinations. Specimens containing the substance C were shown to differ morphologically from the others and were transferred to *C. submitis*, a species proposed as new. Crystals of the D-type were obtained also from specimens of *C. rangiformis* Hoffm. but were not referred to rangiformic acid because Asahina's 1941 report was at that time unknown to the writer. On the basis of this report it is now possible to identify the substance D with rangiformic acid, since the crystals of the D-type (see Evans, 1943, *f. 5*) are essentially like those of rangiformic acid (see Asahina, 1941, *f. 7*). The identity of substances A and B is still obscure. Since these crystals are pale yellow and since they always occur in species containing the yellow usnic acid, it is possible that they may represent aberrant crystals of this acid. Further investigation may decide their identity more definitely.

If the results obtained by the writer are compared with those reported by Asahina they are found to agree in a general way but to differ in certain particulars. Leaving out of consideration the substances A and B, which Asahina did not associate with *C. mitis*, the most marked discrepancy is in relation to rangiformic acid. The writer demonstrated this substance in about 12 per cent of the specimens examined, whereas Asahina reported it in about two-thirds. This discrepancy may be due in part to the fact that he did not, at that time, distinguish between the crystals of rangiformic acid and those of the substance C. A series of 7 specimens from Connecticut, for example, in which he reported rangiformic acid, contain the substance C instead and are among the specimens transferred by the writer to *C. submitis.* The

discrepancy may also be due in part to the fact that the material distributed by Sandstede under certain numbers is not altogether uniform. In Nos. 56, 57, 60, 69, and 118, for example, Asahina reported the presence of rangiformic acid, and yet the writer was unable to detect this substance after repeated tests, indicating that these numbers at least may contain admixtures.

There is evidence of a lack of uniformity also in some of the numbers to which Asahina assigned a P+ reaction. No. 323 belongs in this category. In the set of the *Cladoniae* exsiccatae belonging to Yale University this number is P− and contains no rangiformic acid, although this substance is present in Asahina's set. Nos. 60 and 69, moreover, contain both P− and P+ material, and in the latter ursolic acid can be demonstrated without difficulty. The writer would transfer this P+ material to *C. sylvatica*. The material distributed under these two numbers, therefore, includes both *C. mitis* and *C. sylvatica*.

In the experience of the writer the P+ reaction found in occasional specimens of *C. mitis* is faint and restricted to the apical portions of the podetia. In *C. sylvatica*, on the contrary, the reaction is more extensive and much more pronounced. It still seems justifiable therefore to regard a P− reaction or a faint P+ reaction a characteristic feature of *C. mitis* and a definite P+ reaction a characteristic feature of *C. sylvatica*. Usnic acid could then be considered the characteristic constituent of *C. mitis*, with rangiformic and fumarprotocetraric acids as accessory components; and, in the case of *C. sylvatica*, usnic and fumarprotocetraria acid would represent the characteristic constituents, with ursolic acid as an accessory component.

No definite stations for *C. mitis* from Connecticut were known at the close of 1943 (see Evans, 1944, p. 533), although specimens of other species had been recorded under this name at earlier dates. It is now possible, however, to accredit the species to the state. The form represented is the following:—

*Cladonia mitis f. tenuis Sandst. Abhandl. Naturw. Ver. Bremen **25:** 110. 1922. On earth in a pasture, Norfolk (1945). Sandstede interprets f. *tenuis* as a small race of the species.

Cladonia submitis Evans (1944, p. 533). The podetia of *C. submitis* are definitely P−, and the characteristic lichen-substances present are usnic acid and the substance C'.[4] The

[4] This substance is being investigated by Asahina, but the results of his work have not yet been published.

following records are based on specimens that are indefinite as to form: Andover (1944), Chaplin (1948), Chester (1945), Colebrook (*Hale*, 1948), Coventry (1948), East Lyme (1944), East Windsor (1945), Essex (1945), Groton (*Mrs. Upson*, 1944), Hamden (1946), Killingly (1945), Lebanon (1947), Lisbon (1947), Monroe (1946), Norfolk (1945), Plainfield (1948), Plymouth (1949), Preston (1946), Salem (1947), South Windsor (1945), Sprague (1945), Thompson (1945), Tolland (1944), Trumbull (1945), Washington (1946), Waterbury (1945), and Woodbury (*Sinnott*, 1944).

CLADONIA SUBMITIS f. DIVARICATA Evans (1944, p. 534). Cheshire (1948), East Lyme (1944), Essex (1945), Lisbon (1947), New Canaan (1947), Salem (1947), Southington (*Bunn*, 1945), and Tolland (1944).

CLADONIA SUBMITIS f. PROLIFERA Evans (1944, p. 534). Andover (1944, Chester (1945), East Lyme (1944), Hamden (1946), Meriden (*Johnson*, 1944), Monroe (1946), Salem (1947), and Thompson (1945).

CLADONIA SUBTENUIS (Des Abbayes) Evans (1944, p. 536). The podetia of this species are strongly P+; they contain usnic and fumarprotocetraric acids as characteristic lichen-substances, with ursolic acid as an accessory constituent. The species thus agrees chemically with *C. sylvatica*. Bethel (1947), Bozrah (1945), Bristol (1944), Colebrook (1945), Cornwall (*Johnson*, 1946), Danbury (1949), East Lyme (1944), East Windsor (1945), Ellington (1944), Killingly (1945), Lisbon (1947), Montville (1947), Morris (1946), New Fairfield (1947), Newington (1944), Norfolk (*Evans*, 1945; *Hale*, 1949), North Haven (1945), Plainville (1945), Preston (1946), Sprague (1945), Tolland (1944), West Hartford (1944, Winchester (1946), and Windsor Locks (1947).

CLADONIA SUBTENUIS f. PROLIFERA Evans (1944, p. 539). Bethany (1945).

CLADONIA SUBTENUIS f. SETIGERA (Des Abbayes) Evans (1944, p. 539). Bozrah (1945) and Brookfield (1944).

CLADONIA ALPESTRIS (L.) Rabenh. (1930, p. 387). Except in the rare f. *aberrans* Des Abbayes, which has not been found in Connecticut, *C. alpestris* is definitely P− and contains usnic acid as its characteristic lichen-substance. Perlatolic acid, psoromic acid, and the substances A, B, and C represent accessory constituents (see Evans, 1944, p. 540). Colebrook (*Hale*, 1947). This is the third station in the state for this rare and striking species. According to its collector it occurs in considerable abundance in an old pasture.

Subgenus PYCNOTHELIA

CLADONIA PAPILLARIA (Ehrh.) Hoffm. (1930, p. 389). Atronorine has long been recognized as a characteristic constituent of

C. papillaria, and this was the only lichen-substance reported by the writer in 1944 (p. 541). Asahina, however, had already demonstrated the presence of a second constituent, protolichesteric acid, in the species (1942, p. 490).

Cladonia papillaria f. molariformis (Hoffm.) Schaer. (1930, p. 390). Bethany (1944), Bozrah (1945), Brookfield (1944), East Granby (1949), Groton (*Mrs. Upson*, 1944), Killingly (1945), Lisbon (1947), Plainfield (1948), Redding (1949), Somers (1947), Thompson (1945), and Westbrook (1945).

Cladonia papillaris f. papillosa Fr. (1930, p. 391). Bethany (1944), East Granby (1949), Ellington (1944), Groton (*Mrs. Upson*, 1944), Killingly (1945), Norwalk (1946), Plainfield (1948), Roxbury (1949), and Thomspon (1945).

Cladonia papillaria f. prolifera (Wallr.) Schaer. (1932, p. 124). Granby (1949).

Cladonia papillaria f. stipata Floerke (1930, p. 391). Granby (1949), Meriden (*Burkholder*, 1944), and Southington (*Bunn*, 1945).

Subgenus CENOMYCE

Section Cocciferae

The lichen-substances found in the Connecticut representatives of the red-fruited *Cladoniae* have been tabulated by the writer (1944, p. 559) and will not be further discussed in the present report.

Subsection Subglaucescentes

Cladonia Floerkeana (Fr.) Floerke (1930, p. 392). Although the following varieties are little more than forms they are given varietal rank by recent authors:—

Cladonia Floerkeana var. intermedia Hepp (1930, p. 393). Brookfield (1944), Ellington (1944), Enfield (1945), Glastonbury (1944), Granby (1949), Greenwich (1931), Groton (1949), and Vernon (1946).

Cladonia Floerkeana var. carcata (Ach.) Vainio (1930, p. 394). Monroe (1946).

Cladonia Floerkeana var. carcata f. squamosissima (Th. Fr.) Vainio (1930, p. 394). Southington (*Bunn*, 1944).

Cladonia bacillaris (Ach.) Nyl. (1930, p. 395). Andover (1948), Avon (1949), Bethel (1947), Bolton (1944), Bridgewater (1945), Brookfield (1944), Bozrah (1945), Canaan (1945), Colebrook (*Hale*, 1947), Coventry (1948), East Haven (1944), East Lyme (1944), Ellington (1944), Fairfield (1931, listed, 1932, p. 161, as *C. borbonica* f. *cylindrica*, not new to town), Granby (1949) Greenwich (1926, listed, 1930, p. 482, as *C. borbonica* f. *cylindrica*, not new to town), Groton (1949), Hampton (1948), Lebanon

(1947), Lisbon (1947), Meriden (1933, listed, 1935, p. 56, as *C. borbonica* f. *cylindrica*, earliest record for town), Montville (1947), Morris (1946), Norfolk (*Evans*, 1945; *Hale*, 1949), Norwalk (1946), Putnam (1945), Redding (1949), Ridgefield (1947), Somers (1949), Sprague (1945), Stonington (1949), Thomaston (*Johnson & Neale*, 1945), Thompson (*Neale*, 1947), Tolland (1944), Vernon (1949), Voluntown (1946), Warren (1947), Washington (1946), Waterbury (1949), Watertown (1949), Wethersfield (1944), Willington (*Neale*, 1948), and Wilton (1931, listed, 1932, p. 161, as *C. borbonica* f. *cylindrica*, not new to town). The specimens upon which these records are based are indefinite as to form.

CLADONIA BACILLARIS f. CLAVATA (Ach.) Vainio (1930, p. 397). Ellington (1944), Meriden (*Johnson*, 1944), Tolland (1944), Torrington (1946), and Woodbridge (1944).

CLADONIA BACILLARIS f. PERITHETA (Wallr.) Arn. (1930, p. 397). Bethlehem (1949), Colebrook (*Hale*, 1947), Granby (1949), Madison (*Johnson*, 1946), Monroe (1946), Scotland (*Johnson*, 1946), and Southington (*Bunn*, 1947).

CLADONIA BACILLARIS f. TENUISTIPITATA Sandst. (1935, p. 39). Bethel (1949), Canaan (1945), and Cornwall (1944).

CLADONIA MACILENTA Hoffm. f. STYRACELLA (Ach.) Vainio (1930, p. 399). Bethany (*Johnson*, 1945), Bethel (1949), Bolton (1944), Brookfield (1944), Coventry (1948), Danbury (1949), East Haddam (*Johnson*, 1946), East Lyme (1944), Ellington (1944), Groton (1949), Guilford (1945), Mansfield (1945), Marlboro (1945), Milford (1944), Montville (1946), Morris (1946), Newington (*Miner*, 1944), Pomfret (*Neale*, 1947), Saybrook (1945), Somers (1949), Southington (*Bunn*, 1944), Voluntown (1946), Washington (1949), Waterbury (1945), and Watertown (1949).

*CLADONIA MACILENTA f. OSTREATA (Nyl.) Sandst. in Rabenhorst, Kryptogamen-Fl. **9:** Abt. 4²: 116. 1931. *C. macilenta* var. *ostreata* Nyl. Enum. Gén. Lich. 97. 1857. On an old stump, Groton (*Spencer*, 1949).

The small primary squamules of this distinct form are persistent and grow in loose mats. They are either simple or sparingly incised, and their margins are densely sorediose. At first sight these squamules resemble the form of *C. incrassata* which grows in similar localities. Their positive reactions with K and P, however, will at once distinguish them and indicate their affinity with *C. macilenta*.

*CLADONIA DIDYMA (Fée) Vainio f. PYGMAEA Vainio, Acta Soc. F. et Fl. Fennica **4:** 143. 1887 (as *C. didyma* **γ. *pygmaea*); in Sandstede, Clad. Exsic. *1186*. 1922 (as form). *C. didyma* m.

subulata Sandst. Clad. Exsic. *1685*. 1927; in Evans, Rhodora **34:** 127. 1932 (as form). Groton (1949).

In the opinion of the writer f. *subulata*, which has previously been reported from Connecticut (1932, p. 127), should be regarded as a synonym of the earlier f. *pygmaea*.

Subsection Stramineo-flavidae

Cladonia pleurota (Floerke) Schaer. (1930, p. 400). Bozrah (1945), Bridgeport (1945), Bristol (1944), Brookfield (1944), Canaan (1945). Canterbury (1948), Colebrook (*Evans*, 1945; *Hale*, 1947), East Lyme (1944), Ellington (1944), Groton (*Mrs. Upson*, 1944), Hampton (1948), Killingly (1945), Mansfield (1945), Norwalk (1946), Plainville (1945), Redding (1947) Ridgefield (1947), Sprague (1945), Stafford (1944, Thompson (1945), Tolland (*Miner*, 1944), Waterbury (1945), and West Haven (1945).

Both usnic acid and zeorine have been demonstrated in all the specimens of *C. pleurota* listed in the present report.

Cladonia pleurota f. decorata Vainio (1930, p. 402). Brookfield (1944), Cheshire (*Mrs. Upson*, 1945), Columbia (1948), Coventry (1948), East Lyme (1944), Lebanon (1947), Meriden (*Johnson*, 1945), Morris (1946), Southington (*Bunn*, 1944), and Warren (1947).

Cladonia pleurota f. extensa (Ach.) Sandst. (1944, p. 555). Cheshire (*Mrs. Upson*, 1945), Hampton (1948), Sharon (*Green*, 1884, Eckfeldt Herbarium, earliest record for town of *C. pleurota*), and Southbury (1949).

*Cladonia pleurota f. frondescens (Nyl.) Sandst., in Rabenhorst, Kryptogamen-Fl. **9**, Abt. 4²: 146. 1931. Southington (*Bunn*, 1949). This form has been reported (1930, p. 403) from other stations in Connecticut under the name *C. pleurota* var. *frondescens* (Nyl.) Oliv.

Cladonia deformis (L.) Hoffm. (1944, p. 555). Norfolk (*Hale*, 1949), the second station in Connecticut for this rare and distinctly northern species.

Cladonia cristatella Tuck. f. abbreviata Merrill (1930, p. 409). Colebrook (*Hale*, 1948).

Cladonia cristatella f. aurantiaca Robbins (1935, p. 41). Meriden (*Johnson*, 1944) and Southington (*Bunn*, 1944).

Cladonia cristatella f. Beauvoisii (Del.) Vainio (1930, p. 405). Andover (1944), Beacon Falls (*Johnson*, 1945), Coventry (1948), Norfolk (*Evans*, 1948; *Hale*, 1949), Norwalk (1946), Sprague (1945), Tolland (1944), Washington (1946), and West Hartford (1949). In all of these specimens except the last f. *vestita* is present also.

Cladonia cristatella f. degenerata Robbins (1930, p. 408). Beacon Falls (*Johnson*, 1945), Southington (*Bunn*, 1944), and Stratford (1945).

Cladonia cristatella f. ochrocarpia Tuck. (1930, p. 409). Southington (*Bunn*, 1944).

Cladonia cristatella f. pleurocarpa Robbins (1930, p. 408). Scotland (*Johnson*, 1946).

Cladonia cristatella f. ramosa Tuck. (1930, p. 406). Meriden (*Johnson*, 1944) and Southington (*Bunn*, 1944).

Cladonia cristatella f. scyphulifera Sandst. (1935, p. 41). Canaan (1945), Cheshire (*Mrs. Upson*, 1944), Granby (1949), Meriden (*Johnson*, 1944), Suffield (1949), and Trumbull (1945).

Cladonia cristatella f. squamosissima Robbins (1930, p. 408). Cheshire (*Mrs. Upson*, 1944), Ellington (1944), Norfolk (1948), and Southington (*Bunn*, 1944).

Cladonia cristatella f. squamulosa Robbins (1930, p. 410). Meriden (*Johnson*, 1944) and Southington (*Bunn*, 1944).

Cladonia cristatella f. vestita Tuck. (1930, p. 407). Avon (1949), Bridgeport (1945), Chaplin (*Neale*, 1946), Ellington (1944), Farmington (1944), Groton (*Mrs. Upson*, 1944), Killingly (1945), Newton (1944), Putnam (1945), Redding (1949), and Trumbull (1945).

Cladonia incrassata Floerke (1932, p. 129). Brookfield (1944), Danbury (1949), Enfield (1945), Granby (1949), Lebanon (1947), Middlebury (1948), Norfolk (*Ball*, 1945), Oxford (1945), Seymour (1948), Somers (1949), Tolland (1944), Voluntown (1946), and Waterbury (1945).

Cladonia incrassata f. squamulosa (Robbins) Evans (1932, p. 129). Southington (*Bunn*, 1944) and Voluntown (1946).

Section Ochrophaeae

Subsection Unciales

The lichen-acids found in various species of *Unciales* were listed by Asahina in 1942 (pp. 293–502). The species studied included *C. Boryi*, *C. caroliniana*, and *C. uncialis*, the three representatives of the subsection found in Connecticut. Asahina reported the presence of usnic acid in all of these species but found no other lichen-substance in either *C. Boryi* or *C. caroliniana*. In most European specimens of *C. uncialis*, however, he found that squamatic acid was present in addition. The specimens tested were those distributed by Sandstede in his *Cladoniae* Exsiccatae and a few of these, mostly from northern Europe, were found to contain usnic acid only.

Two years later the writer (1944, p. 562) confirmed Asahina's statements independently. He demonstrated usnic acid in the three species under consideration and showed that all the specimens of *C. uncialis* from Connecticut contained squamatic acid also, although some of the specimens from farther north in America lacked this substance. He found further that substances A and B (see Evans, 1943, pp. 421, 422) might be present in *C. caroliniana* and substance A in *C. uncialis*.

Cladonia uncialis (L.) Web. (1930, p. 413). The following records are based on specimens that are indefinite as to form: Bozrah (1945), Chester (1945), East Haven (1944), East Lyme (1944), Harwinton (1946), Hebron (1944), Lebanon (1947), Litchfield (*Smith*, 1947), Manchester (1945), New Canaan (1947), Norfolk (*Evans*, 1945; *Hale*, 1949), North Branford (*Burkholder*, 1944), Preston (1946), Roxbury (1949), Sprague (1945), Tolland (1944), Torrington (1946), Union (1947), Warren (1947), Washington (1949), Waterbury (1945), Waterford (1949), Watertown (1949), Winchester (1946), and Woodbridge (1944).

Cladonia uncialis f. obtusata (Ach.) Nyl. (1930, p. 415). Southington (*Johnson*, 1945; *Bunn*, 1947).

Cladonia uncialis f. setigera Anders (1932, p. 134). Thomaston (*Johnson & Neale*, 1945).

Cladonia uncialis f. soraligera Robbins (1935, p. 42). Manchester (1945) and Preston (1946).

Cladonia uncialis f. spinosa Oliv. (1930, p. 417). Cheshire (*Mrs. Upson*, 1944), Cornwall (1944), Southington (*Bunn*, 1945), and Woodbridge (1944).

Cladonia uncialis f. subobtusata Coem. (1932, p. 133). Manchester (1945) and Southington (*Bunn*, 1947).

Cladonia caroliniana (Schwein.) Tuck. f. dilatata Evans (1932, p. 138). Avon (1949), Bozrah (1945), Cheshire (*Mrs. Upson*, 1944), East Lyme (1944), Glastonbury (1945), Meriden (*Burkholder*, 1944), Preston (1946), Sprague (1945), Warren (1947), and Watertown (1949).

Cladonia caroliniana f. fibrillosa Evans (1932, p. 139). Cheshire (*Mrs. Upson*, 1944) and Southington (*Bunn*, 1944).

Cladonia caroliniana f. prolifera Evans (1932, p. 139). East Lyme (1944), Hamden (*Johnson*, 1945), Meriden (*Johnson*, 1945), Monroe (1946), New Canaan (1947), Preston (1946), Sprague (1945), anf Woodbridge (1944).

Cladonia caroliniana f. tenuiramea Evans (1932, p. 139). Avon (1949), Bozrah (1945), Danbury (1949), East Haven (1944), Groton (*Mrs. Upson*, 1944), Harwinton (1946), Killingly (1945), Lisbon (1947), Meriden (*Johnson*, 1945), Monroe (1946),

North Stonington (1946), Redding (1949), Sprague (1945), Torrington (1946), Warren (1947), and Woodbridge (1944).

CLADONIA BORYI Tuck. f. LACUNOSA (Bory) Tuck. (1930, p. 418). Avon (1949), Lebanon (1947), Salisbury (*Dix*, 1946), and Southington (*Bunn*, 1945).

CLADONIA BORYI f. PROLIFERA Robbins (1930, p. 419). Salisbury (*Dix*, 1945) and Southington (*Bunn*, 1945).

CLADONIA BORYI f. RETICULATA (Russell) Merrill (1932, p. 141). Cheshire (1948).

Subsection CHASMARIAE

Group MICROPHYLLAE

CLADONIA FURCATA (Huds.) Schrad. (1930, p. 420). In 1942 (p. 664) Asahina reported on the chemistry of *C. furcata*. Although Zopf had maintained that the species produced both fumarprotocetraric acid and atronorine, Asahina found that the vast majority of the specimens at his disposal contained fumarprotocetraric acid only. These specimens included a series from Japan, 60 European specimens distributed by Sandstede in his *Cladoniae* Exsiccatae, 5 North American specimens also distributed by Sandstede, and 43 additional North American specimens from the herbarium of Yale University. Among all these specimens atronorine was demonstrated in only 5, 4 from Europe and 1 from North America. The last came from the island of Nantucket and was collected by W. H. Sheldon in 1940 (No. 105). On the basis of these results Asahina concluded that fumarprotocetraric acid was the only lichen-substance characteristic of *C. furcata* and that specimens containing atronorine should be either excluded from *C. furcata* altogether or interpreted as a transitional form between *C. furcata* and *C. subrangiformis* Sandst. The latter species was proposed as new by Sandstede in 1922 (p. 165) and was based on a series of specimens from various parts of Europe. In the opinion of Des Abbayes (1937, p. 160) it represents a subspecies of *C. furcata*, and there is as yet no evidence that it occurs in North America.

Two years after the publication of Asahina's paper the writer (1944, p. 565) reported independently that many specimens of *C. furcata* lacked atronorine and suggested that this substance be interpreted as an accessory component of the species. Over 200 specimens from Connecticut have since been tested, and only two of these—one from New Milford (1930, p. 420) and the other

from Washington (1930, p. 423)—have yielded the characteristic crystals of atronorine when treated with the G. A. o-T. solution. Specimens from eastern Massachusetts, however, have given different results. Thirty-five specimens from the Cape Cod region, Martha's Vineyard, and Nantucket were tested, and 18 were found to contain atronorine. Of the specimens from Nantucket, 17 in number, only 3 lack this substance. Since the specimens with atronorine are not morphologically different from those without, the writer still feels justified in interpreting atronorine as an accessory constituent of *C. furcata*, in spite of its relatively rare occurrence.

In the following lists of stations most of the records are new, but a few represent revisions of older records. Stations dated 1928 or earlier, for example, have previously been reported simply under the species, without reference to definite varieties or forms.

Cladonia furcata var. palamaea (Ach.) Vainio (1930, p. 425). Bethany (1945), Bethel (1949), Bozrah (1945), Brookfield (1944), Chester (1945), Guilford (1932, not before recorded), Lisbon (1947), Madison (1927), Manchester (1945), New Haven (*Nichols*, 1909), North Haven (1927), North Stonington (1946), Ridgefield (*Mrs. Hartmann*, 1939, listed, 1944, p. 565, as var. *racemosa*), Salem (1947), Salisbury (*Dix*, 1946), Southington (*Bunn*, 1944), Stonington (1940, listed, 1944, p. 565, as var. *racemosa*), Warren (1947), and Woodbridge (1944).

Cladonia furcata var. palamaea f. rigidula (Mass.) Oliv. (1935, p. 44). Cornwall (1944), Middlefield (1927), Southington (*Bunn*, 1946), Thomaston (*Johnson*, 1945), and Weston (1941).

Cladonia furcata var. pinnata (Floerke) Vainio (1930, p. 424). Thomaston (*McDonnell*, 1935, listed, 1938, p. 13, as var. *racemosa* f. *squamulifera*).

Cladonia furcata var. pinnata f. foliolosa (Del.) Vainio (1930, p. 424). Norfolk (*Hale*, 1949).

Cladonia furcata var. racemosa (Hoffm.) Floerke (1930, p. 422). Barkhamsted (1928), Bethany (1925), Bethel (1947), Bozrah (1945), Branford (1928), Bristol (1944), Colebrook (1945), Ellington (1944), Groton (1949), Guilford (1935), Killingworth (1932, listed, 1935, p. 43, as *C. furcata*), Ledyard (1927), Lisbon (1947), Manchester (1943), Middlebury (*Musch & Evans*, 1929, listed, 1932, p. 153, as *C. furcata*), Middletown (*Wright*, 1883, listed, 1930, p. 424, as var. *pinnata*), Monroe (1933, listed, 1935, p. 43, as *C. furcata*), Montville (1947), Morris (1946), Newington (1944), New Milford (1928), Newtown (1928), North Branford

(*Nichols*, 1909; *Musch & Evans*, 1927, listed, 1930, p. 423, as var. *racemosa* f. *furcatosubulata*), Oxford (1945), Preston (1946), Saybrook (*Musch & Evans*, 1928, not before recorded), Seymour (*Musch & Evans*, 1928, listed, 1930, p. 424, as var. *pinnata*), Sharon (*Green*, 1884, Eckfeldt Herbarium, not before recorded), Thompson (*Neale*, 1947), Tolland (1944), Torrington (1946), Union (1947), Washington (1949), Westbrook (1935), West Hartford (1944), West Haven (*Hall*, 1872, 1873, not before recorded), Wethersfield (1944), and Woodbridge (1926).

CLADONIA FURCATA var. RACEMOSA f. CORYMBOSA (Ach.) Vainio (1930, p. 423). Clinton (1935), East Haven (*Hall*, 1875, not before recorded), Southington (*Bunn*, 1944), and Sprague (1945).

CLADONIA FURCATA var. RACEMOSA f. FURCATOSUBULATA (Hoffm.) Vainio (1930, p. 422). Bethlehem (1949), Branford (1928, not before recorded), Brookfield (1944), East Hampton (1928, listed, 1930, p. 422, as var. *racemosa*), Groton (1949), Manchester (1945), Newtown (1944), Norfolk (*Evans*, 1945; *Hale*, 1949), Southington (*Bunn*, 1945), and Sprague (1945).

*CLADONIA FURCATA var. RACEMOSA f. **prolifera** f. nova, podetia ramulis adventiciis brevibus tecta.—On earth. Southington (*Bunn*, 1944, No. 6034).

This form is analogous to the proliferous forms found in the *Cladinae* and *Unciales*. The short, adventive branches, which characterize the form, spring from prostrate podetia.

CLADONIA FURCATA var. RACEMOSA f. SQUAMULIFERA Sandst. (1932, p. 153). Bethel (1947), Canaan (1928, listed, 1930, p. 424, as var. *pinnata*), Chaplin (*Neale*, 1946), Chester (1945), East Hartford (*Weatherby*, 1905, listed, 1930, p. 424, as var. *pinnata* f. *foliolosa*), Essex (1931, listed, 1932, p. 153, as *C. furcata*), Hartland (1928), Kent (1926, listed, 1930, p. 424, as var. *pinnata* f. *foliolosa*, and p. 425, as f. *truncata*), Killingworth (*Hall*, 1874, earliest record for town), Lisbon (*Mrs. Spencer*, 1947) Meriden (1927, listed, 1930, p. 424, as var. *pinnata*), Monroe (*Neale*, 1945), New Fairfield (1947), New Milford (1928), Norfolk (*Evans*, 1945; *Hale*, 1949), Oxford (1925), Pomfret (*Mrs. Paine*, 1934, listed, 1938, p. 13, as *C. scabriuscula* f. *farinacea*), Thomaston (1940), Thompson (*Neale*, 1947), Union (1947), Warren (1947), Watertown (1949), and Wethersfield (*Clark*, 1933, listed, 1935, p. 43, as *C. furcata*).

CLADONIA FURCATA var. RACEMOSA f. SUBCLAUSA Sandst. (1930, p. 423). Canaan (1945).

CLADONIA SCABRIUSCULA (Del.) Leight. (1930, p. 426).

According to Vainio (1887, p. 345) *Cenomyce scabriuscula* Del., upon which *Cladonia scabriuscula* is based, is the same as *C. furcata* γ. *racemosa* c. *surrecta* Floerke. The species is typified,

therefore, by what is now called *C. scabriuscula* f. *surrecta* (Floerke) Sandst. (see Sandstede, 1931, p. 215). This form is abundant in Europe, in northern Asia, in Canada, and in northern New England. It becomes rarer southward, however, and the specimens listed below represent the first records for Connecticut.

*Cladonia scabriuscula f. surrecta (Floerke) Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 215. 1931. *C. furcata* *η. *racemosa* **C. surrecta* Floerke, Clad. Comm. 154. 1828. *C. surrecta* Sandst. Abhandl. Naturw. Ver. Bremen **25:** 164. 1922. On roadside banks, North Haven (1945) and Thompson (1945).

The podetia of f. *surrecta* branch sparingly by repeated dichotomies. In its typical development the cortex in the basal portion is continuous or subcontinuous, much as in *C. furcata*. This type of cortex extends upward for a variable distance and passes gradually into a cortex composed of minute areolae, separated by whitish lines. On some of the podetia the areolate cortex extends to the tips of the branches, but as a rule the areolae in the apical portion are replaced by minute appressed or spreading squamules, which give the surface a roughened appearance. Among the squamules ecorticate areas, variable in extent, can be distinguished. Granular soredia also are present on most of the podetia, and there are all gradations between these and the spreading squamules. In addition to the minute squamules a few much larger squamules are usually developed, especially in the basal portions of the podetia.

The characteristic lichen-substance of *C. scabriuscula* is fumarprotocetraric acid, and the plants in consequence are definitely P+. According to Asahina (1942, p. 667) this acid is the only substance present in most specimens of the species, but he detected atronorine also in four European examples of f. *surrecta* from Sandstede's *Cladoniae* exsiccatae. The writer (1944, p. 508) found the substance E, now identified with ursolic acid, in many specimens and interpreted this substance as an accessory component of the species. Atronorine, however, could not be demonstrated in any of the material examined.

In 1930 the writer (p. 427) recorded a series of specimens from Connecticut under the name *C. scabriuscula* f. *farinacea* (Vainio) Sandst. and has since reported the same form from numerous

additional stations in the state (1932, p. 154; 1935, p. 45; 1938, p. 13; and 1944, p. 568). Vainio based the form, under the name *C. furcata* γ. *scabriuscula* f. *farinacea*, on specimens collected by Hariot at Punta Arenas, Patagonia, but later (1894, p. 450) reported it also from New Bedford, Massachusetts, citing specimens collected by Willey. In 1926 Sandstede, in his *Cladoniae* Exsiccatae, distributed specimens from Wareham, Massachusetts, collected by Robbins, under the name *C. scabriuscula—farinacea*, and in 1938 (1938a, p. 86) listed the plant definitely as a variety of *C. scabriuscula*. Two years later Degelius (1940, p. 33), in listing specimens of this species from Maine, expressed the opinion that the var. *farinacea* might perhaps represent a distinct species. The writer is now convinced that this is the case and therefore proposes that var. *farinacea* be raised to specific rank, as indicated below.

*Cladonia **farinacea** (Vainio) comb. nov. *C. furcata* γ. *scabriuscula* f. *farinacea* Vainio, Acta Soc. F. et Fl. Fennica **4:** 339. 1887. *C. furcata* var. *farinacea* Vainio in Hariot, Jour. de Bot. **1:** 283. 1887. *C. cenotea* var. *magellanica* Vainio in Hariot, *l. c.* 1887 (as synonym). *C. cenotea* var. *corticata* Vainio in Hariot, *Ibid.* 284. 1887 (*nomen nudum*). *C. scabriuscula—farinacea* Sandst. Clad. Exsic. 1569. 1926. *C. scabriuscula* f. *farinacea* Sandst. in Evans, Trans. Connecticut Acad. **30:** 427. 1930. *C. scabriuscula* f. *subtestacea* Robbins in Evans, *Ibid.* 428. 1930. *C. scabriuscula* var. *farinacea* Sandst. in Hannig & Winkler, Pflanzenareale IV, Heft 7: 86. 1938.

Through the kindness of Dr. Lars Fagerström, of the University of Helsingfors, the writer has had the privilege of studying Hariot's specimen of *C. furcata* γ. *scabriuscula* f. *farinacea* from the Vainio Herbarium. This specimen, which came from Punta Arenas, may be designated the type of *C. farinacea*, although (according to Hariot) Vainio's *C. furcata* var. *farinacea* was based on a specimen collected at Port Famine, Straits of Magellan, by Jacquinot. It may be added that a label bearing the name *C. cenotea* var. *corticata*, listed by Hariot without description, is enclosed with the type. In 1894 (p. 450) Vainio definitely reduced both *C. cenotea* var. *magellanica* and *C. cenotea* var. *corticata* to synonymy under f. *farinacea*.

A careful comparison of Hariot's specimen, which is shown in Fig. 1, with North American specimens which have been referred

to *C. scabriuscula* f. *farinacea* fails to bring out any essential differences, in spite of their wide geographical separation. A characteristic example of the North American plant is shown in Fig. 2.

In fields, on banks, and on soil over rocks. The following represent new stations for the species in Connecticut: Cheshire (*Mrs. Upson*, 1945), Danbury (1949), East Haven (*Neale*, 1947), Ellington (1944), Groton (1949), Madison (*Johnson*, 1946), Marlboro (1945), Norfolk (*Evans*, 1945; *Hale* 1949), Preston (1946), Sprague (1945), Tolland (1944), Union (1947), and Warren (1947). These and the stations already listed under *C. scabriuscula* f. *farinacea* give a total of 69 towns for the state. Outside of Connecticut *C. farinacea* is widely distributed in North America, and its known range in the eastern part of the continent extends as far south as North Carolina and as far west as Wisconsin. There is no evidence that the species occurs in Europe.

The primary squamules of *C. farinacea*, which are sparingly produced, grow in depressed mats and are essentially like those of *C. furcata*. The squamules are short-lived, and many of the colonies consist entirely of podetia, which continue their growth independently and form more or less compact tufts.

The podetia as a rule are less branched than in *C. furcata*, and some of them may remain undivided. The branching is by dichotomies or by whorls of three or four, and the majority of the axils are perforate without being dilated. In a dichotomy or whorl the branches may be subequal and diverge slightly from one another. In many cases, however, one branch is much longer than the others and grows in the same direction as the branching axis, deflecting the shorter branch or branches to one side. If this process is repeated a sympodium is formed. In addition to the open axils some of the podetia show longitudinal slits in the wall.

A normal podetium shows a division into a basal portion with a continuous or subcontinuous cortex, an apical portion producing an abundance of farinose soredia, and an intermediate portion in which the cortex is broken through by a series of sorediose areas, rounded or irregular in outline. In the upper part of this portion the sorediose areas tend to be larger than in the lower part and

usually coalesce to a greater or less extent. Where the cartilaginous layer of the wall is exposed in the apical portion it appears opaque and whitish, becoming darker with age. As a rule the corticate and sorediose portions are about equal in extent and occupy more than two-thirds the length of the podetia. The intermediate portion, in fact, may be lacking altogether, in which case there is a sharp transition between the corticate and sorediose portions.

The podetia vary greatly in size. Robust examples are 80–100 mm. in length and 1.5–2.5 mm. in diameter, but there are all gradations between these and depauperate examples only 10 mm. in length and 0.5 mm. in diameter. The color is greenish or dingy gray, varying to brownish gray. If the tinge is pronounced the specimens represent *C. scabriuscula* f. *subtestacea* Robbins, but this form (in the writer's opinion) is hardly distinct enough to deserve a special name. Podetial squamules, essentially like the primary squamules, are present in some cases, but many podetia lack them. These squamules are usually few in number and scattered. Well-developed apothecia and spermagonia of *C. farinacea* are still unknown.

The chemical features of *C. farinacea* are in agreement with those of *C. scabriuscula.* In other words fumarprotocetraric acid is the characteristic lichen-substance of the species and ursolic acid an accessory constituent. Tests for atronorine have all given negative results.

In its general habit *C. farinacea* resembles sparingly branched specimens of *C. furcata*, and the variations in color are much the same, although brownish shades are more frequently met with in the latter species. Soredia, however, are completely lacking in *C. furcata* and represent one of the most characteristic features of *C. farinacea.* These soredia, farinose in character, abundantly produced, and unaccompanied by minute squamules, will distinguish the species also from *C. scabriuscula*, in which the soredia are granular, sparingly produced, and accompanied by numerous spreading and appressed squamules.

Cladonia multiformis Merrill (1930, p. 428). This species, as shown by Asahina (1942, p. 668) and by the writer (1944, p. 568), contains fumarprotocetraric acid but no atronorine.

Cladonia multiformis f. Finkii (Vainio) Evans (1930, p. 429). Colebrook (*Miner*, 1945), Cornwall (*Green*, 1884, Eck-

feldt Herbarium, determined as *C. gracilis* var. *hybrida*, earliest record for town), Meriden (*Johnson*, 1945), Southington (*Bunn*, 1944), and Warren (1947).

Cladonia multiformis f. simulata Robbins (1930, p. 429). Norfolk (*Hale*, 1949).

Cladonia squamosa (Scop.) Hoffm. (1930, p. 432). According to Asahina (1942, p. 625) squamatic acid is the only lichen-substance produced by *C. squamosa*. The writer, however (1944, p. 572), obtained crystals of the F and G types in some cases, in addition to squamatic acid. The chemical composition of these crystals is still unknown. The following records are based on specimens that are indefinite as to form: Cheshire (*Mrs. Upson*, 1944), Cornwall (1944), Ellington (1944), Glastonbury (*Miner*, 1944), Groton (1949), Meriden (*Johnson*, 1945), Oxford (1945), Roxbury (1949), Seymour (1948), and Sprague (1945).

Cladonia squamosa f. murina Scriba (1930, p. 437). Norfolk (*Ball*, 1945; *Hale*, 1949) and Seymour (1948).

Cladonia squamosa f. phyllopoda Vainio (1935, p. 46). Southington (*Bunn*, 1947).

Cladonia squamosa f. squamosissima Floerke (1930, p. 434). Avon (1949), Cornwall (*Neale*, 1946), Madison (*Johnson*, 1948), Meriden (*Johnson*, 1946), Norfolk (1945), Tolland (1944), and Washington (1949).

Cladonia atlantica Evans (1944, p. 573).

From a chemical standpoint, as already shown by the writer, *C. atlantica* is characterized by the presence of baeomycic acid, in addition to squamatic acid. The baeomycic acid gives a yellow color with P, and characteristic crystals can be obtained by the use of the G. A. Q. solution. These crystals are minute and can easly escape detection. In 1942, however, Asahina (1942a, p. 622) recommended another compound, orthoanisidine, for the demonstration of the acid. A 5 per cent solution of this substance in an equal amount of glycerine and alcohol, known as the G. A. o-Anis. solution, is used. If this solution is added to the dried acetone extract of a lichen containing baeomycic acid, and gentle heat applied, yellow crystals in the form of thick needles or rods, in many cases with frayed ends, will be formed; but, if the acid is present in small amount, several hours may elapse before the crystals make their appearance.

Cladonia atlantica f. ramosa Evans (1944, p. 575). Danbury (1949), Glastonbury (*Miner*, 1945), Milford (1944), New-

town (1945), Roxbury (1949), West Haven (1945), Wethersfield (1944), and Willington (1944).

CLADONIA ATLANTICA f. RAMOSISSIMA Evans (1944, p. 576). Berlin (*Johnson*, 1949), Branford (1945), North Haven (1945), Southington (*Bunn*, 1944), and West Haven (1945).

CLADONIA ATLANTICA f. SUBSIMPLEX Evans (1944, p. 574). Hamden (1946) and Meriden (*Johnson*, 1945).

In addition to the three forms listed a fourth form, f. *microphylla* Evans, was included under *C. atlantica* in 1944. This form agrees with the others in containing baeomycic acid and, therefore, in turning yellow when treated with P, but differs in some of its morphological features. The writer is now convinced that f. *microphylla* is not conspecific with the other forms but that it represents a synonym of *C. Beaumontii* (Tuck.) Vainio, the identity of which was established by Robbins in 1927. At that time he thought that the distribution of the species was "wholly southern," but Fink (1935, p. 261) has since extended its known range northward to Massachusetts.

*CLADONIA BEAUMONTII (Tuck.) Vainio, Acta Soc. F. et Fl. Fennica **10:** 455. 1894. *C. santensis* b. *Beaumontii* Tuck. Syn. N. Am. Lich. **1:** 245. 1882. *C. stenophylliza* Vainio in Sandstede, Clad. Exsic. 1184. 1922 (*nomen nudum*). *C. microphylliza* Merrill, Bryologist **27:** 22. 1924. *C. exasperatula* Merrill, *Ibid.* **27:** 23. 1924. *C. atlantica* f. *microphylla* Evans, Trans. Connecticut Acad. **35:** 577. 1944. On decayed wood in a *Chamaecyparis* swamp, Voluntown (1933), the only known station in Connecticut.

When Tuckerman described this species in 1882, as a variety or form of *C. santensis*, he listed only two specimens, one collected by Curtis in North Carolina and the other by Beaumont in Alabama. Twelve years later Vainio, in raising the plant to specific rank, stated that North Carolina specimens from the Tuckerman Herbarium were strongly K+. In 1927 Robbins showed that the two specimens listed by Tuckerman were specifically distinct. He referred Curtis' specimen to "*C. squamosa* f. *multibrachiata* Floerke" and typified *C. Beaumontii* by Beaumont's specimen. He also showed that both of these were K− and that the K+ specimens studied by Vainio were referable to *C. floridana* Vainio, a species based on specimens collected by Rapp at Sanford, Florida, in 1924. In addition to the type-specimen of *C. Beaumontii* Robbins cited specimens from Sanford, also collected by Rapp, but listed no other stations. He expressed the opinion

that the species was a member of the subsection *Clausae* and that it was perhaps related to *C. pityrea* (Floerke) Fr., belonging to the group *Thallostelides.*

In 1930 Sandstede (p. 49), in his sequence of species, placed *C. Beaumontii* between *C. floridana* and *C. santensis* Tuck., thus implying that it belonged in the subsection *Chasmariae;* but Fink, in 1935 (p. 261), placed it between *C. leptothallina* Merrill and *C. decorticata* (Floerke) Spreng. He thus agreed with Robbins in considering the species a member of the *Clausae* but associated it with the *Podestelides*, rather than with the *Thallostelides.* Three distinct views regarding the taxonomic position of *C. Beaumontii* have thus been brought forward. In the opinion of the writer, however, the morphological and chemical features of the species clearly indicate that Sandstede was correct in placing it among the *Chasmariae.*

The synonyms of *C. Beaumontii* include *C. stenophylliza, C. microphylliza,* and *C. exasperatula,* all based on specimens collected by Rapp at Sanford, Florida. The first was reduced to synonymy by Robbins in 1927 (p. 138) and the other two by Sandstede in 1938 (p. 47). The valuable series of *Cladoniae* in the "Severin Rapp Memorial Collection," now the property of the Florida Agricultural Experiment Station at Gainsville, has been sent to the writer for study by the curator, Dr. Lillian E. Arnold, and in this series the three species under consideration are well represented by specimens determined by Merrill. There seems to be no doubt that all three should be regarded as synonyms. It should be pointed out, however, that the determinations were made before the characteristic features of *C. Beaumontii* were well understood.

The yellow color produced in *C. Beaumontii* by the addition of P was first noted by Sandstede (1938, p. 47). This reaction, as in *C. atlantica*, indicates the presence of baeomycic acid, and the two species agree further in producing squamatic acid in addition. The podetia of *C. atlantica*, however, are distinguished from those of *C. Beaumontii* by the presence of open cups, even if these are somewhat obscured in f. *ramosissima* by the excessive production of marginal proliferations. The podetial cortex is further distinguished by being continuous or subcontinuous throughout. In *C. Beaumontii* the podetia are cupless and the blunt apices are

slightly, if at all, dilated; the podetial surface, too, although corticate in large part, shows ecorticate areas of variable extent.

The primary squamules of *C. Beaumontii* are larger and more luxuriant than those of *C. atlantica* and tend to be deeply laciniate with narrow, more or less crenulate, divisions. They are pale grayish above, white beneath, and destitute of soredia. The cylindrical podetia are simple or sparingly branched, and the axils and apices, although closed in some cases, are open in others. Some, but not all, of the podetia bear scattered squamules, smaller than the primary squamules but otherwise resembling them. Even more distinctive, however, are the minute podetial squamules, which are usually produced in abundance. These may be accompanied by isidioid outgrowths but not by soredia. The dark brown apothecia and spermagonia, if present at all, are borne at the tips of the podetia.

The specimens listed below from stations outside Connecticut are in the Yale Herbarium and will give some idea of the distribution of *C. Beaumontii*, which is apparently endemic to North America.

Massachusetts: West Tisbury, Martha's Vineyard (*Torrey*, 1936).

New York (Long Island): Montauk (*Latham*, 1945), Flanders (*Latham*, 1946), and Northwest (*Latham*, 1947).

New Jersey: Green Bank, Burlington Co. (*Dix*, 1943).

North Carolina: Roanoke Island, Dare Co. (*Torrey*, 1937); Chapel Hill, Orange Co. (*Evans*, 1938); Havelock, Craven Co. (*Anderson & Evans*, 1939); Chinquapin, Duplin Co. (*Anderson & Evans*, 1939); Ellerbe, Richmond Co. (*Anderson & Evans*, 1939); Star, Montgomery Co. (*Anderson & Evans*, 1939); and Wingate, Union Co. (*Gray*, 1939).

The specimens from Florida will be listed in another connection.

Cladonia carassensis Vainio, Acta Soc. F. et Fl. Fennica **4:** 313. 1887. *C. japonica* Vainio in Hue, Nouv. Arch. Mus. Hist. Nat. III. **10:** 265. 1898. This rare species has been reported in North America from Massachusetts (Robbins, 1924, p. 146), Connecticut (*Evans*, 1935, p. 47) and Oregon (*Asahina*, 1942, p. 664) and has been collected also in Nova Scotia, Maine, New York (Long Island), and California.

In 1942 Asahina reported the presence of thamnolic acid in specimens from Massachusetts and Oregon and pointed out the strong resemblance between *C. carassensis* and *C. japonica*, in

which he had already demonstrated the same acid (1938, p. 768). He expressed the opinion, in fact, that the two species were synonymous.

Vainio's *C. japonica* was based on specimens collected by Faurie at three different stations in Japan and has since been found in only two or three additional localities in that country. Outside of Japan it has been reported from the Tatra Mountains in eastern Europe, from Haiti, and from New Zealand. The first report from the Tatra Mountains was made in 1930 by Vainio, who cited specimens collected by Timkó under the name *C. japonica* var. *tatrana* Vainio. Later in the same year Sandstede (p. 50) referred Nos. 880 and 1707 of his *Cladoniae* exsiccatae, both of which had been collected by Suza in the Tatra Mountains, to the same species and variety. No. 880 had been issued under the name *C. subsquamosa* f. *subulata* Sandst. and No. 1707 under the name *C. subsquamosa* f. *nuda* Sandst. In 1931 he figured these two forms (*pl. 35, f. 10, 11*) and listed them in the explanation of his plate under *C. japonica* var. *tatrana*. The reports from Haiti and New Zealand were likewise made by Sandstede (1938a, p. 87), who thus ascribed to the species a wide geographical distribution.

The writer has studied Nos. 880 and 1707 and also a Japanese specimen of *C. japonica* (No. 171) from the Asahina Herbarium, collected by Kimura at the Konsei Pass, Nikko, in the province of Simotuke (listed by Asahina, 1938, p. 768). Sandstede's figures of *C. japonica*, based on some of Faurie's material (1938, *pl. 7, f. 52*), as well as those of *C. japonica* var. *tatrana*, have thrown further light on the distinctive features of the species. These various specimens and figures indicate a considerable range of variation but present no characters that would distinguish *C. japonica* from the North American specimens of *C. carassensis*. The writer is therefore convinced that Asahina was justified in considering them conspecific.

The question now arises, are these specimens from the Northern Hemisphere the same as Vainio's specimens from the Carassa Mountains of Brazil, the only station cited for *C. carassensis* in the original description? The writer has studied a Brazilian specimen of *C. carassensis* collected by Vainio in 1885 and representing a part of the material upon which the species is based. This

specimen is labeled f. *irregularis* Vainio, but is essentially like Sandstede's figure of the species (1938, *pl. 5, f. 37*), which is referred to f. *subregularis* Vainio. There is evidently some confusion in names here, since the specimen figured came from "Carassa," Brazil, whereas f. *subregularis* was based on specimens from Massachusetts. In any case the figure, in the opinion of the writer, represents f. *irregularis* and not f. *subregularis*.

The specimens of f. *irregularis* are slightly more robust than northern specimens, and the successive branches of the podetia tend to be closer together, so that the plants at first sight appear distinct. The histological features of the podetia, however, are similar, and the apparent differences might well come within the range of variation of a single species. The writer is therefore inclined to accept the views of Vainio and Sandstede that the specimens from Massachusetts (and from other northern localities) belong to the same species as the plants from Brazil.

The podetia of *C. carassensis* in their usual development bear a striking resemblance to those of *C. atlantica* f. *subsimplex* and f. *ramosa* and also to those of *C. crispata* and *C. squamosa* in certain of their forms. In all these plants the podetia develop open cups, which broaden out gradually or abruptly from terete basal portions. The branching is by irregular dichotomies, with open or closed axils, and by proliferations from the margins of the cups. These may arise singly or in whorls and may in turn form smaller cups or terminate in blunt or sharp apices, closed or with minute perforations. The podetial surface may appear smooth, and the groups of algal cells under these circumstances are indistinguishable. As a rule, however, these groups, covered with a more or less distinct cortex, stand out clearly and may even project slightly. They are irregular in shape and in size, and the bands or lines separating them, although pale at first, may become slightly darkened with age. Podetial squamules may be lacking altogether or present in greater or less abundance. Soredia are never produced.

The podetial wall varies in thickness from about 100 μ to about 400 μ but is mostly between 100 μ and 200 μ. The portion of the wall inside the algal zone is mostly 70–130 μ in thickness and is vaguely divided into two concentric layers. The inner layer bounding the central canal is composed throughout of coalescent

hyphae and represents a true cartilaginous tissue. The outer layer, which may equal the inner in thickness or be considerably thinner, is likewise largely composed of coalescent hyphae but contains air-spaces in which the hyphae are merely interwoven. These air-spaces are narrow in some cases and broader in others, and the cartilaginous tissue may be more or less broken up into strands. In some of the podetia strands of this type can be demonstrated among the groups of algal cells, just within the external, or cortical, layer of the wall. This external layer, which is 10–20 μ in thickness, is variable in its composition. In some of the specimens the hyphae, of which the layer is composed, are coalescent outside the groups of algal cells and form a true cortex, one or two cells in thickness. As a rule, however, air-spaces are present, even outside the groups of algal cells, and are always to be found outside the spaces separating the groups.

From a chemical standpoint *C. carassensis* is amply distinct from *C. atlantica*, *C. crispata* and *C. squamosa*. Owing to the presence of thamnolic acid the plants are definitely K+ and P+. This substance is not produced by the other three species. In *C. atlantica*, which is K− but P+ yellow, the characteristic lichen-substance is baeomycic acid, although squamatic acid is present also; in *C. crispata* and *C. squamosa*, which are both K− and P−, squamatic acid is the characteristic component. In addition to thamnolic acid *C. carassensis* may contain the substances F and G, the chemical compositoin of which is still unknown (see Evans, 1944, p. 577).

Several of the forms of *C. carassensis* and *C. japonica* that have been described are based on slight and inconstant differences. Vainio's f. *subregularis*, for example, is said to differ from [f. *irregularis*] m. *regularis* only in color (see Robbins, 1924, p. 14), and f. *obliqua* Robbins, according to the description, differs from f. *irregularis* in the same way. It is doubtful, also, if the presence of squamules by itself offers sufficient grounds for the recognition of such forms as f. *digressa* Vainio (1887, p. 315) or f. *obliqua* m. *spectabilis* Robbins, since podetia with squamules and podetia without squamules may occur side by side in the same colony. The North American specimens of *C. carassensis* examined by the writer illustrate the two forms listed below.

*Cladonia carassensis f. regularis Vainio, Acta Soc. F. et Fl. Fennica **4:** 315. 1887 (as β. *regularis*); *Ibid.* **14**[1]**:** 237. 1897 (as f. *irregularis* m. *regularis*); in Zahlbruckner, Cat. Lich. Univ. **4:** 454. 1926 (as f. *regularis*). *C. carassensis* f. *subregularis* Vainio in Robbins, Rhodora **26:** 146. 1924. *C. subsquamosa* f. *nuda* Sandst. Clad. Exsic. 1707. 1927. *C. japonica* f. *tatrana* Vainio, Magyar Botan. Lapok **29:** 22. 1930. *C. japonica* f. *nuda* Sandst. in Rabenhorst. Kryptogamen-Flora **9**, Abt. 4[2]: 290. 1931.

Nova Scotia: Bear Cove (*Evans*, 1936); Cape Sable and Sable River (*Evans*, 1936); and Lake Kejimkujak (*Evans*, 1936).

Maine: Hancock (*Evans*, 1936); and Whiting (*Evans*, 1936).

Massachusetts: Mashpee (*Torrey*, 1937); Nantucket (*Sheldon*, 1938); and Wareham (*Robbins*, 1924, distributed in Sandstede's Clad. Exsic. 1393, as *C. carassensis* f. *subregularis* m. *spectabilis;* and *Blake*, 1931).

Connecticut: Stafford (*Evans*, 1932, listed, 1935, p. 47, as *C. carassensis*).

New York (Long Island): Napeague (*Latham*, 1947); Northwest (*Latham*, 1948); and Springs (*Latham*, 1947).

Oregon: Gunter (*Sipe*, 1936); Hecata Beach Road (*Sipe*, 1939); Reedsport (*Sipe*, 1937); and Sultan Lake (*Sipe*, 1939).

In f. *regularis* well-developed cups are present, 2–4 mm. in diameter and approximately horizontal. They are associated in most of the specimens with narrower cups of the same general character and, in some cases, with oblique and irregular cups. In some colonies podetial squamules are present to a greater or less extent; in others they are completely lacking.

Cladonia carassensis f. **subulata** (Sandst.) comb. nov. *C. subsquamosa* f. *subulata* Sandst. Clad. Exsic. 880. 1922. *C. japonica* f. *subulata* Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4[2]: 290. 1931.

California: Pilascetos Creek Canyon (*Herre*, 1943).

The podetia in f. *subulata* are more densely crowded than in f. *regularis* and more copiously branched. The cups present, although open, are scarcely or not at all dilated, and many of the branches are cupless and blunt or sharply pointed. Scattered podetial squamules are present in some abundance. The specimens from California agree in all essential respects with the specimens from the Tatra Mountains distributed by Sandstede.

Cladonia cenotea (Ach.) Schaer. (1932, p. 154). Squamatic acid is the only lichen-substance that has been demonstrated in this species (see Asahina, 1942, p. 680, and Evans, 1944, p. 577). The plants are therefore K− and P−.

Cladonia cenotea f. crossota (Ach.) Nyl. (1944, p. 578). Colebrook (*Hale*, 1948), the second station in Connecticut for this northern form.

Cladonia delicata (Ehrh.) Floerke (1930, p. 438). Thamnolic acid is the characteristic lichen-substance of *C. delicata* (see Asahina, 1942, p. 679, and Evans, 1944, p. 578), and the plants in consequence are K+ and P+. In some cases the yellow color produced by K is transitory and quickly succeeded by brownish hues.

Cladonia delicata f. quercina (Pers.) Floerke (1930, p. 439). Bolton (1944), Enfield (1944), Meriden (*Burkholder*, 1944), and Norfolk (*Hale*, 1949).

Cladonia caespiticia (Pers.) Floerke (1930, p. 439). Andover (1948), Avon (1944), Bethel (1947), Bethlehem (1949), Bolton (1944), Bridgeport (1945), Canaan (1945), Columbia (1948), Cornwall (1945), East Granby (1947), East Haven (1944), Easton (1949), Ellington (1944), Farmington (1944), Groton (1949), Hampton (1948), Marlboro (1945), Monroe (*Neale*, Montville (1947), Morris (1946), Naugatuck (*Johnson & Neale*, 1945), New Canaan (1947), Newington (1944), Newtown (1944), Norfolk (*Evans*, 1945; *Hale*, 1949), Norwalk (1946), Plainville (1945), Preston (1946), Ridgefield (1947), Salisbury (1948), Saybrook (1945), Seymour (1945), Thompson (*Neale*, 1947), Tolland (1949), Union (1947), Vernon (1946), Warren (1947), Washington (1946), West Haven (1945), Westport (1947), Wethersfield (1944), and Wolcott (1945).

Although atronorine and squamatic acid have been reported in *C. caespiticia*, Asahina showed in 1942 (p. 678) that fumarprotocetraric acid was the only lichen-substance present, and the writer in 1944 (p. 579) confirmed this statement.

Group Megaphyllae

Cladonia apodocarpa Robbins (1930, p. 440). Andover (1944), Bethlehem (1949), Bozrah (1945), Bridgeport (1945), Canaan (1945), Chester (1945), Colebrook (1945), Danbury (1949), East Lyme (1944), Ellington (1944), Essex (1945), Farmington (1944), Glastonbury (1944), Killingly (1945), Manchester (1945), Montville (1947), Norfolk (1948), North Haven (1945), Orange (1944), Preston (1946), Putnam (1945), Redding (1947), Ridgefield (1947), Salem (1947), Salisbury (1945), Somers (1949), Southbury (*Johnson*, 1944), Sprague (1945), Thompson (1945), Union (1947), Washington (1946), Waterbury (1945), Weston (1949), Wethersfield (1944), Winchester (1944), and Woodbury (*Sinnott*, 1944).

The lichen-substances found in *C. apodocarpa* are atronorine and fumarprotocetraric acid (see Asahina, 1942, p. 683, and Evans, 1944, p. 579). The plants therefore turn yellow with K and red with P. The color produced by K, although faint, is usually evident of the reagent is applied to the chalky white lower surface of the squamules.

Cladonia turgida (Ehrh.) Hoffm. (1930, p. 441). Norfolk (*Hale*, 1949).

This rare species is still known from only six towns in Connecticut, all in the northwestern part of the state. It contains both atronorine and fumarprotocetraric acid, thus agreeing with *C. apodocarpa*, but the reaction with P may be faint or even lacking altogether.

Cladonia turgida f. corniculata Floerke (1930, p. 442). Colebrook (*Hale*, 1948).

Cladonia turgida f. scyphifera Vainio (1930, p. 442). Colebrook (*Hale*, 1948).

Subsection Clausae

Group Podostelides

Subgroup Helopodium

Cladonia capitata (Michx.) Spreng. (1944, p. 582).

Fumarprotocetraric acid is the only lichen-substance definitely associated with this species (see Asahina, 1943, p. 48, and Evans, 1944, p. 582), and the plants turn bright red when treated with P.

Cladonia capitata f. epiphylloma Evans (1944, p. 583). Southington (*Bunn*, 1947), the second known station for this form.

Cladonia capitata f. imbricatula (Nyl.) Evans (1944, p. 583). Andover (1948), Bethel (1949), Bethlehem (1949), Bridgeport (1945), Colchester (1947), Glastonbury (1944), Lisbon (1947), Mansfield (1945), Marlboro (1945), New Fairfield (1947), Plainville (1945), Redding (*Mrs. Upson*, 1946), Somers (1949), Tolland (1949), Union (1947), Warren (1947), Washington (1949), and West Hartford (1949).

Cladonia capitata f. pallida (Robbins) Evans (1944, p. 583). Canaan (*Miner*, 1945), Meriden (*Johnson*, 1945), Naugatuck (*Johnson & Neale*, 1945), Southington (*Bunn*, 1944), Union (1947), and Warren (1947).

Cladonia capitata f. squamulosa (Merrill) Evans (1944, p. 583). Southington (*Bunn*, 1945), the second station in Connecticut for this form.

Cladonia cariosa (Ach.) Spreng. (1944, p. 584).

It has long been known that atronorine represents a characteristic lichen-substance of *C. cariosa* (see Asahina, 1943, p. 50, and Evans, 1944, 584), and that the plants in consequence turn yellow when treated with K. One or more other substances, however, may also be present, at least as accessory components, but the identity of these substances is still in doubt.

Cladonia cariosa f. cribrosa (Wallr.) Vainio (1944, p. 585). Southington (*Bunn*, 1945), the third station in Connecticut for this rare species.

Cladonia clavulifera Vainio (1930, p. 446).

The only lichen substance found in the present species is fumarprotocetraric acid (see Asahina, 1943, p. 52, and Evans, 1944, p. 585). It thus agrees chemically with *C. capitata* and yields an equally vivid red color when treated with P.

Cladonia clavulifera f. epiphylla Robbins (1930, p. 448). Meriden (*Johnson*, 1945) and Southington (*Bunn*, 1944).

Cladonia clavulifera f. nudicaulis Evans (1930, p. 447). East Windsor (1945), Groton (1949), Manchester (1945), Meriden (*Johnson*, 1945), Montville (1946), Redding (1949), Salem (1947), Southington (*Bunn*, 1944), Thompson (1945), Westbrook (1945), and Wethersfield (1944).

Cladonia clavulifera f. pleurocarpa Robbins (1930, p. 447). Redding (1949).

Cladonia clavulifera f. subvestita Robbins (1930, p. 447). Avon (1949), East Windsor (1945), Orange (1944), Salem (1947), Southington (*Bunn*, 1944), and Wethersfield (1944).

Cladonia subcariosa Nyl. (1930, p. 449). Brookfield (1944), Canaan (1945), Colebrook (1945), Cornwall (1945), Groton (1949), Lisbon (1947), Marlboro (1945), Monroe (1946), Newington (1944), Newtown (1944), Norfolk (1945), Norwalk (1946), Orange (1944), Redding (*Mrs. Upson*, 1945), Torrington (1946), Union (1947), Warren (1947), Waterbury (1945), Weston (1949), Westport (1947), and West Hartford (1944).

The specimens upon which these records are based are sterile or show rudimentary podetia. All, however, turn red with K and yield characteristic crystals when tested for norstictic acid, the only lichen-substance associated with the species (see Asahina, 1943, p. 51, and Evans, 1944, p. 586).

Cladonia subcariosa f. evoluta Vainio (1930, p. 450). Andover (1948), Bethel (1949), Bethlehem (1949), Bridgeport (1945), Bristol (1944), Brookfield (1944), Chester (1945), Dan-

bury (1949), East Granby (1947), Enfield (1945), Farmington (1944), Groton (1949), Harwinton (1946), Killingly (1945), Lisbon (1947), Manchester (1945), Montville (1947), Morris (1946), Newington (1944), Plainville (1945), Preston (1946), Redding (1949), Somers (1949), West Haven (1945), and Weston (1949).

CLADONIA SUBCARIOSA f. PLEUROCARPA Robbins (1930, p. 451). Bethel (1949) and Salisbury (1948).

CLADONIA SUBCARIOSA f. RAMOSA Dix (1944, p. 587), Southington (*Bunn*, 1947).

CLADONIA SUBCARIOSA f. SQUAMULOSA Robbins (1930, p. 451). Canaan (1945), Danbury (1949), East Haven (1945), East Granby (1947), Meriden (*Johnson*, 1944), Monroe (1946), Morris (1946), Southington (*Bunn*, 1944), and West Haven (1945).

CLADONIA BREVIS Sandst. (1932, p. 156). Granby (1949), Middlebury (1949), Roxbury (1949), and Southington (*Bunn*, 1945).

This relatively rare species is now known from fifteen towns in the state. In 1943 (p. 53) Asahina showed that psoromic acid was a characteristic lichen-substance of *C. alpicola* var. *karelica* Vainio and that the plants in consequence turned bright yellow when treated with P. This variety is now considered a synonym of *C. brevis*, and the writer (1944, p. 588) has independently demonstrated the presence of psoromic acid in North American material of this species. Although *C. alpicola* (Flot.) Vainio agrees with *C. brevis* in containing psoromic acid the latter is clearly a member of the subgroup *Helopodium*, since the spermagonia are borne on the primary squamules. In the subgroup *Macropus*, to which *C. alpicola* belongs, the spermagonia are restricted to the podetia.

Subgroup MACROPUS

CLADONIA NORRLINI Vainio (1913, p. 454). Colebrook (*Hale*, 1948) and Salisbury (1945, 1948).

In 1944 *C. Norrlini* was known from only one town in Connecticut, North Canaan, where it was discovered in 1928. It is a pleasure to report this rare species from two additional towns. All are in the northwestern part of the state. According to Asahina (1943, p. 55) atronorine and psoromic acid are both produced by *C. Norrlini*, and the plants in consequence turn yellow with K and also with P. He based his observations on No. 1574

of Sandstede's *Cladoniae* Exsiccatae, collected by Robbins at Jackson, New Hampshire, in 1925. In a specimen from Wardsboro, Vermont, however, collected by the writer in 1940, he found atronorine only, although P still gave a slight reaction. In the following year (1944, p. 588) the writer noted the same color-reactions with K and P and reported the presence of atronorine, but not of psoromic acid, in specimens from various parts of North America. Fortunately some of the specimens from Salisbury yield characterisitc crystals of psoromic acid, as well as those of atronorine. It seems justifiable, therefore, to interpret the latter substance as the characteristic lichen-substance of *C. Norrlini* and psoromic acid as an accessory constituent. The presence of atronorine distinguishes the species chemically from *C. alpicola*, in which psoromic acid alone is produced.

Cladonia decorticata (Floerke) Spreng. (1932, p. 158). Colebrook (*Hale*, 1948), the second station in Connecticut for this rare species.

The negative reactions with K and with P will at once distinguish *C. decorticata* from the other known species of the subgroup *Macropus*. A few years ago (1943, p. 56) Asahina reported the presence of perlatolic acid in the species, and soon afterwards the writer (1944, p. 589) called attention to certain colorless crystals obtained by treating the dried acetone extract with the G. E. solution. It is now possible to identify these crystals with perlatolic acid.

Group Thallostelides

The lichen-substances found in the species of the *Thallostelides* occurring in Connecticut have recently been listed by Asahina (1943, pp. 227–240) and by the writer (1944, p. 609). In the present report, therefore, these substances will not be discussed in detail. It may be noted, however, that fumarprotocetraric acid is found in all our species, although in a few it occurs only as an accessory constituent.

Cladonia gracilis (L.) Willd. var. dilatata (Hoffm.) Vainio (1930, p. 457). Colebrook (*Hale*, 1948), East Haddam (*Johnson*, 1946), and Southington (*Bunn*, 1947).

Cladonia gracilis var. dilatata f. dilacerata (Floerke) Vainio (1930, p. 457). Meriden (*Johnson*, 1944).

Cladonia gracilis var. dilatata f. squamulosa (Schaer.) Sandst. (1930, p. 458). Colebrook (*Hale*, 1948) and Norfolk (*Hale*, 1949).

Cladonia verticillata (Hoffm.) Schaer. (1930, p. 458). The following records are based on specimens that are indefinite as to form: Meriden (*Johnson*, 1945), Saybrook (1945), Southington (*Bunn*, 1944, with pale apothecia), West Hartford (1949), and Windsor Locks (1947).

Cladonia verticillata f. aggregata (Del.) Oliv. (1935, p. 50). East Lyme (1949), Ellington (1944), Farmington (1944), Goshen (1949), Meriden (*Johnson*, 1944), Norfolk (*Hale*, 1949), Southington (*Bunn*, 1944), Torrington (*Johnson*, 1946), and Warren (1947).

Cladonia verticillata f. apoticta (Ach.) Vainio (1930, p. 460). Cheshire (*Mrs. Upson*, 1946), Meriden (*Johnson*, 1945), Morris (1946), Norfolk (*Hale*, 1949), Southington (*Bunn*, 1944), and Woodstock (*Kincaid & Neale*, 1947).

Cladonia verticillata f. evoluta (Th. Fr.) Stein (1930, p. 459). Andover (1948), Cheshire (*Mrs. Upson*, 1946), Colchester (1947), Colebrook (*Evans*, 1945; *Hale*, 1948), Farmington (1944), Hampton (1948), Norfolk (*Evans*, 1945; *Hale*, 1949), Southington (*Bunn*, 1944), Somers (1949), Sprague (1945), Warren (1947), Woodbridge (1944), and Woodstock (*Kincaid & Neale*, 1947).

Cladonia verticillata f. phyllocephala (Flot.) Oliv. (1930, p. 461). Colebrook (1945), Meriden (*Johnson*, 1945), and Southington (*Bunn*, 1944).

Cladonia mateocyatha Robbins (1930, p. 461). The following records are based on sterile specimens or on specimens with immature podetia: Cheshire (*Mrs. Upson*, 1944), Colebrook (*Hale*, 1948), Orange (1944), Redding (1949), and Southington (*Bunn*, 1944).

Cladonia mateocyatha f. leioscypha Evans (1930, p. 463). Bozrah (1945), Groton (1949), Newtown (1945), Plainfield (1948), and Southington (*Bunn*, 1944).

Cladonia mateocyatha f. squamulata Robbins (1930, p. 462). Bethany (*Johnson*, 1945), Colebrook (*Hale*, 1948), Groton (1949), Meriden (*Johnson*, 1945), Putnam (1945), Southington (*Bunn*, 1944), and Wolcott (1945).

Cladonia pyxidata (L.) Hoffm. var. neglecta (Floerke) Mass. f. simplex (Ach.) Harm. (1930, p. 464). Andover (1944), Branford (1944), Colebrook (1948), Cornwall (1944), East Haven (1945), East Granby (1947), East Lyme (1944), Farmington (1944), Glastonbury (*Miner*, 1944), Groton (1949), Killingly (1945), New Fairfield (1947), Norfolk (*Evans*, 1945; *Hale*, 1949), North Stonington (1946), Preston (1946), Prospect (1949), Salem (1947), Somers (1949), Torrington (1946), Warren (1947),

Washington (1949), Waterbury (1945), and Woodstock (*Kincaid & Neale*, 1947).

Cladonia pyxidata var. neglecta f. lophyra (Ach.) Koerb. (1930, p. 465). Southington (*Bunn*, 1944).

Cladonia pyxidata var. pocillum (Ach.) Flot. (1930, p. 465). Salisbury (1948).

Cladonia chlorophaea (Floerke) Spreng. f. carpophora (Floerke) Anders (1930, p. 470). Goshen (*Underwood*, no date, Eckfeldt Herbarium, probably the earliest collection of the species for the town).

Cladonia chlorophaea f. costata (Floerke) Arn. (1930, p. 469). Cheshire (*Mrs. Upson*, 1946).

Cladonia chlorophaea f. simplex (Hoffm.) Arn. (1930, p. 468). Colebrook (1945), Cornwall (1945), Newtown (1945), Salisbury (1945), Stafford (1944), Warren (1947), and Willington (1944).

Cladonia Grayi Merrill (1932, p. 159). Grayanic acid has been demonstrated in all the specimens listed below under the various forms of this species.

Cladonia Grayi f. carpophora Evans (1938, p. 20). Bozrah (1945), Colebrook (1948), Colchester (1945), East Lyme (1949), East Windsor (1945), Enfield (1945), Harwinton (1946), Lebanon (1947), Montville (1946), Newtown (1944), Norfolk (*Ball*, 1945; *Hale*, 1949), Ridgefield (1947), Roxbury (1949), Sprague (1945), Voluntown (1948), West Hartford (1944), and Woodbridge (1944).

Cladonia Grayi f. cyathiformis Sandst. (1935, p. 53). Andover (1944), Bethel (1947), Bloomfield (1949), Bozrah (1945), Bridgeport (1945), Brookfield (1944), Colchester (1947), Columbia (1948), East Lyme (1944), Ellington (1944), Farmington (1944), Granby (1949), Groton (*Mrs. Upson*, 1944), Hamden (1946), Killingly (1945), Lebanon (1947), Montville (1947), Newington (1944), Newtown (1944), Norwalk (1946), Orange (1945), Preston (1946), Redding (1947), Ridgefield (1947), Saybrook (1945), Sprague (1945), Stafford (1945), Thompson (1945), Union (1947), Warren (1947), Washington (1946), West Hartford (1944), West Haven (1945), and Wethersfield (1944).

*Cladonia Grayi f. **lacerata** f. nova, scyphi margine plus minusve profunde et irregulariter lacerato.—Meriden (*Johnson*, 1945, No. 6424).

In this remarkable form the margins of the cups are deeply and irregularly lacerate with narrow divisions.

Cladonia Grayi f. prolifera Sandst. (1938, p. 19). East Lyme (1949).

Cladonia Grayi f. squamulosa Sandst. (1932), p. 160). Andover (1944), Avon (1949), Bethany (*Burkholder*, 1944), Brookfield (1944), Chaplin (*Neale*, 1946), Cheshire (*Mrs. Upson*,

1944), Coventry (1948), East Haven (1944), Granby (1949), Harwinton (1946), Newington (1944), Newtown (1945), Norfolk (*Evans*, 1948; *Hale*, 1949), North Haven (1945), Plainville (1945), Seymour (1948), Suffield (1949), Warren (1947), Washington (1946), West Haven (1945), and Westport (1949).

CLADONIA CRYPTOCHLOROPHAEA Asahina (1944, p. 600). Cryptochlorophaeic acid has been demonstrated in all the specimens upon which the following records are based: Bethlehem (*Spencer*, 1949), Cheshire (*Mrs. Upson*, 1944), Colebrook (*Hale*, 1947), Colchester (1945), Columbia (1948), Cornwall (1948), Coventry (1948), East Haven (1945), Ellington (1944), Hebron (1944), Manchester (1945), Meriden (*Burkholder*, 1944), New Britain (1941), Norfolk (*Evans*, 1945; *Hale*, 1949), Plainville (1945), Redding (1949), Saybrook (1945), Seymour (1948), Washington (1949), Woodbridge (1944), and Woodstock (*Kincaid & Neale*, 1947).

CLADONIA CONISTA (Ach.) Robbins f. SIMPLEX Robbins (1930, p. 472). Avon (1944), Bethel (1947), Bethlehem (*Spencer*, 1949), Canaan (1945), East Lyme (1944), Ellington (1944), Essex (1945), Norfolk (1948), North Haven (1945), Preston (1946), Ridgefield (1947), Somers (1949), Stafford (1944), Tolland (1949), Union (1947), Warren (1947), Washington (1949), Willington (1944), Woodbridge (1944), and Woodbury (*Sinnott*, 1944).

These records are based on specimens in which crystals of the substance H (see Evans, 1944, p. 602) have been demonstrated.

CLADONIA FIMBRIATA (L.) Fr. (1930, p. 473). Chaplin (*Neale*, 1946), Colebrook (*Evans*, 1944; *Hale*, 1948), Ellington (1944), Marlboro (1945), Meriden (*Johnson*, 1945), Scotland (*Johnson*, 1946), and Southington (*Bunn*, 1944).

The earlier record for Colebrook (*Nichols*, 1912, 1935, p. 53) was based on specimens of *C. Grayi* f. *cyathiformis* (1944, p. 598).

CLADONIA MAJOR (Hag.) Sandst. (1935, p. 54). Scotland (*Johnson*, 1946), the fifth station in Connecticut for this unusual species.

*CLADONIA CORNUTORADIATA f. SUBULATA (L.) Sandst. Abhandl. Naturw. Ver. Bremen **21:** 373. 1912. *Lichen subulatus* L. Sp. Plant. 1153. 1753 (in part). *Cladonia fimbriata* γ. *cornutoradiata* γ.[2] *subulata* Vainio, Acta Soc. F. et Fl. Fennica **4:** 282. 1887. Norfolk (*Hale*, 1949), the second station in Connecticut for this northern species.

The record for the first station, in the town of Goshen (1938, p. 22), was based on specimens of f. *radiata* (Schreb.) Sandst., in which the podetia form distinct cups with marginal proliferations.

In f. *subulata* the podetia are cupless, cylindrical structures, simple or sparingly and irregularly branched with closed axils. In both forms the podetial surface is sorediose throughout the greater part of its extent.

Cladonia nemoxyna (Ach.) Nyl. (1930, p. 475). Andover (1948), Avon (1944), Columbia (1948), Enfield (1945), Farmington (1944), Hampton (1948), Killingly (1945), Lisbon (1947), Mansfield (1945), Milford (1931), Norfolk (*Evans*, 1945; *Hale*, 1949), North Haven (1945), Putnam (1945), Saybrook (1945), Scotland (*Johnson*, 1945), Seymour (1948), Sprague (1945), Thompson (1945), Union (1947), Warren (1947), Washington (1949), Waterbury (1945), Westport (1947), Willington (1944), and Woodstock (*Kincaid & Neale*).

Homosekikaic acid, the characteristic lichen-substance of *C. nemoxyna*, has been demonstrated in all the specimens of the species that are listed in the present report.

Cladonia nemoxyna f. fibula (Ach.) Vainio (1930, p. 477). Bethel (1949), Colebrook (1945), North Haven (1945), Southington (*Bunn*, 1944), Suffield (1949), and Warren (1947).

Cladonia nemoxyna f. phyllocephala Arn. (1930, p. 477). Branford (1945).

Cladonia nemoxyna f. Rei (Schaer.) Anders (1938, p. 23). Branford (1945) and Norfolk (1948).

Cladonia ochrochlora Floerke (1935, p. 55). Cheshire (*Mrs. Upson*, 1944), Ellington (1944), Redding (1949), and Southington (*Bunn*, 1944). A relatively rare species now known from eleven towns in the state.

Cladonia coniocraea (Floerke) Spreng. f. ceratodes (Floerke) Dalla Torre & Sarnth. (1930, p. 479). Andover (1948), Avon (1949), Branford (1926, listed, 1930, p. 482, as *C. borbonica* f. *cylindrica*, earliest Branford record for the species), Bolton (1944), East Lyme (1944), Ellington (1944), Enfield (1945), Groton (1949), Hampton (1948), Killingworth (1932, earliest record for town), Lebanon (1947), Lisbon (1947), Manchester (1945), Montville (1946), New Fairfield (1947), Norfolk (*Evans*, 1945; *Hale*, 1949), Norwalk (1946), Old Saybrook (1931, listed, 1932, p. 161, as *C. borbonica* f. *cylindrica*), Redding (1947), Saybrook (1945), Somers (1949), Southington (*Bunn*, 1944), Stratford (*Mrs. Miner*, 1945), Tolland (1944), Vernon (1948), Waterbury (1945), Watertown (1949), West Haven (1945), Woodbridge (1944), and Woodstock (*Neale*, 1946).

Cladonia coniocraea f. expansa (Floerke) Sandst. (1932, p. 160). Norfolk (1948).

Cladonia coniocraea f. phyllostrota (Floerke) Vainio (1930, p. 481). Cheshire (*Mrs. Upson*, 1944), Cornwall (*Johnson*, 1946), Norfolk (*Hale*, 1949), and Saybrook (1945).

Cladonia coniocraea f. pycnotheliza (Nyl.) Vainio (1932, p. 161). Ellington (1944), Norfolk (*Hale*, 1949), Seymour (1948), and Southington (*Bunn*, 1945).

Cladonia coniocraea f. robustior (Harm.) Sandst. (1932, p. 161). Southington (*Bunn*, 1945) and Tolland (1944).

Cladonia coniocraea f. stenoscypha (Stuckenberg) Sandst. (1938, p. 24). Bethlehem (1949), Branford (1945), Goshen (1949), Norfolk (*Hale*, 1949), and Southington (*Bunn*, 1947).

Cladonia coniocraea f. subpellucida (Aigr.) Anders (1944, p. 607). Washington (1949).

Cladonia coniocraea f. truncata (Floerke) Dalla Torre & Sarnth. (1930, p. 480). Andover (1948), Avon (1949), Ellington (1944), Groton (1949), Manchester (1945), Norfolk (*Hale*, 1949), Saybrook (1945), Somers (1949), Southington (*Bunn*, 1944), Tolland (1944), and Vernon (1949).

Cladonia borbonica (Del.) Nyl. (1930, p. 481).

The material of *Cenomyce borbonica* Del., upon which this species was based, was collected on the island of Réunion and is preserved in the Paris Museum. Vainio included the species (1894, p. 343) among the varieties of *C. fimbriata*, under the name η. *borbonica* (Del.) Vainio, and assigned to it an extensive geographical distribution, citing stations in Madagascar and other African islands, in Asia, in Australasia, and in North and South America. The North American stations, however, were confined to Mexico and the West Indies.

Apparently Allen (1930, p. 93) was the first to report *C. borbonica* from Canada and the United States. He listed specimens from the Gaspé Peninsula, Quebec, and noted the occurrence of the species also in Vermont, Alabama, and Florida. Later in the same year (1930, p. 481) the writer included *C. borbonica* among the *Cladoniae* found in Connecticut and proposed f. *cylindrica* Evans and f. *squamulosa* Robbins as new forms. At that time the species was recorded from only 18 towns in the state. Subsequent explorations, however, have increased the number of towns to 74 (1932, p. 161; 1935, p. 56; 1935, p. 24, 1944, p. 607). The species has been reported also from numerous other localities in eastern North America.

In 1940 (p. 717) Asahina showed that a series of specimens of *C. borbonica* f. *cylindrica* from Connecticut and New Jersey con-

tained grayanic acid, as well as fumarprotocetraric acid, and that the closely related *C. Balfourii* contained fumarprotocetraric acid only.

In 1946 (p. 250) Des Abbayes reported *C. borbonica* from Fayal, Flores, and Pico, three islands of the Azores group, and in 1947 (p. 108) referred his specimens more definitely to *C. borbonica* f. *cylindrica.* In doing so he noted that they agreed with specimens of this form from the United States determined by the writer. At the same time he pointed out that the material from the Azores and from the United States differed in certain important respects from the original specimens of *C. borbonica* in the Paris Museum. In these, according to his account, the podetia are branched slender structures, abruptly dilated to form small but distinct cups. In the specimens of f. *cylindrica,* on the contrary, the podetia are not dilated and form indistinct cups. In view of these differences Des Abbayes questions the advisability of retaining the North American and Azorean plants in *C. borbonica* and suggests that they may represent an undescribed species. Asahina has since reported to the writer, in a letter dated March 15, 1949, that he could find no grayanic acid in a specimen of *C. borbonica* from Réunion. This specimen, which he had received from Des Abbayes, had been determined by Nylander.

It thus appears that the specimens referred by American students to *C. borbonica* differ both morphologically and chemically from the specimens of *C. borbonica* collected on the island of Réunion. The writer feels convinced, therefore, that these should be separated out as a distinct species, as suggested by Des Abbayes. Since the epithet *cylindrica* has not been used as the name of a species in the genus *Cladonia,* the simplest procedure would be to elevate *C. borbonica* f. *cylindrica* to specific rank, as follows:—

*Cladonia **cylindrica** (Evans) comb. nov. *C. borbonica* f. *cylindrica* Evans, Trans. Connecticut Acad. **30:** 482. 1930. In addition to the stations already listed under *C. borbonica* f. *cylindrica* the following new stations for the species may be reported: Andover (1948), Avon (*Miner,* 1944), Bethel (1947), Branford (1941), East Lyme (1944), Ellington (1944), Granby (1949), Meriden (*Johnson,* 1943, 1944), Milford (1944), Montville (1946), Norfolk (*Hale,* 1949), Orange (*Evans,* 1926, listed, 1930,

p. 396, as *C. bacillaris*), Saybrook (1945), Somers (1949), Washington (1949), and Windsor Locks (1947).

The primary squamules of *C. cylindrica* grow in loose mats and tend to disappear from old colonies. They are of small size, and even the best-developed examples rarely exceed 1 mm. in length and in width. Many of the squamules are irregularly crenulate along the broad apical margins; otherwise they are undivided or vaguely incised.

The podetia in characteristic specimens are rarely more than 10 mm. in height and 1 mm. in diameter; many, in fact, are distinctly shorter and narrower. In colonies growing on a subvertical substratum the podetia in many cases, as shown in Fig. 3, curve into a suberect position and form loose clusters, in which the elements are parallel with one another. The majority of the podetia are sterile, unbranched cylinders, which contract abruptly at the rounded, obtuse, or subacute apices, or else form narrow and indistinct cups, which may or may not give off short marginal spines. Fertile podetia, which are usually sparingly produced, are tipped with large apothecia or with irregular rings of smaller apothecia. The podetia are destitute of a cortex, except perhaps at the very base, and are characterized by the presence of farinose soredia, replaced toward the base by larger bodies in the form of coarse granules or minute squamules. Larger squamules, however, are normally lacking. In areas where neither soredia nor larger bodies are present the podetial surface appears whitish and opaque, since the cartilaginous layer is rarely exposed.

Perhaps the closest relative of *C. cylindrica* in the Connecticut flora is the common and variable *C. coniocraea*. This species in its usual development is more robust than *C. cylindrica*, its primary squamules are larger and more complex, and its podetia are considerably taller. These podetia, in f. *ceratodes* at least, taper more gradually and to sharper points than in *C. cylindrica*, and the soredia, which are produced in abundance, are uniformly farinose and not intermingled with larger bodies. Although both species turn a vivid red when treated with P, the presence of grayanic acid will distinguish *C. cylindrica* chemically from *C. coniocraea*, in which this substance is lacking.

In a general way the podetia of *C. cylindrica* resemble those of the red-fruited *C. bacillaris* in certain of its forms, and sterile

specimens of the two have been confused. The application of P will at once distinguish them. In *C. cylindrica* a red color at once appears; in *C. bacillaris* there is no color-change whatever. The following forms of *C. cylindrica* may be distinguished:

*Cladonia cylindrica f. **ramosa** (Evans) comb. nov. *C. borbonica* f. *ramosa* Evans, Trans. Connecticut Acad. **35:** 607. 1944.

*Cladonia cylindrica f. **scyphifera** f. nova, podetia simplicia, scyphifera, a stipite-cylindrico sensim dilatata, scyphis angustis, margine integro aut irregulariter dentato.—On a stump in damp woods. Andover (*Evans*, 1948, No. 6830).

In f. *scyphifera* the podetia are more robust than in the typical form and increase gradually in diameter from about 1 mm. at the base to about 2 mm. at the apex, where shallow but more or less distinct cups can be distinguished. The margins of the cups are entire or irregularly dentate, and some of the teeth are tipped with rudimentary apothecia.

*Cladonia cylindrica f. **squamulosa** (Robbins) comb. nov. *C. borbonica* f. *squamulosa* Robbins in Evans, Trans. Connecticut Acad. **30:** 482. 1930.—Southington (*Bunn*, 1945, 1947), the tenth town in Connecticut where this form has been collected. It is characterized by the presence of distinct podetial squamules in greater or less abundance.

*Cladonia pityrea (Floerke) Fr. var. Zwackhii Vainio f. phyllophora (Mudd) Vainio, Acta Soc. F. et Fl. Fennica **10:** 355. 1894. *C. pyxidata* µ. *pityrea* g. *phyllophora* Mudd, Mon. Brit. Clad. 16. 1865. Tolland (1944). The podetia in this form are squamulose and lack both cups and soredia.

Cladonia pityrea var. Zwackhii f. squamulifera Vainio (1930, p. 485). Cheshire (*Mrs. Upson*, 1946) and Voluntown (1948).

Cladonia pityrea var. Zwackhii f. subacuta Vainio (1930, p. 485) Andover (1948), Bolton (1944), Bristol (1934), Canaan (1945), East Lyme (1944), Hampton (1948), Norfolk (*Hale*, 1949), Union (1947), Warren (1947), and West Haven (1945).

Group Foliosae

Cladonia Robbinsii Evans (1944, p. 611). Andover (1944), Bethany (1945), Cheshire (1948), Chester (1945), Colchester (1947), East Granby (1949), East Lyme (1944), Glastonbury (1944), Groton (*Mrs. Upson*, 1944), Lisbon (1936), Meriden (*Burkholder*, 1944), Newington (1944), New London (1936), Plymouth (1949), Preston (1946), Redding (1949), Saybrook (1945), Stonington (1949), Thompson (1945), Wethersfield (1944), Woodbridge (1944), and Woodbury (*Sinnott*, 1944).

The characteristic lichen-substances of *C. Robbinsii*, as pointed out in the original description (1944, p. 610), are usnic acid, barbatic acid, and the unknown substance F. The species in consequence is P−. In the related *C. foliacea* (Huds.) Willd. usnic acid is likewise present, but the barbatic acid is replaced by fumarprotocetraric acid. This species in consequence is P+ red. Asahina, in a letter dated November 4, 1948, has confirmed the presence of barbatic acid in *C. Robbinsii*.

Cladonia Robbinsii f. squamulosa Evans (1944, p. 613). Meriden (*Burkholder*, 1944), the second known station for this unusual form.

Cldonia strepsilis (Ach.) Vainio (1930, p. 487). Bozrah (1945), Bridgeport (1945), Farmington (1944), Groton (1949), Hebron (1944), Milford (1944), Monroe (1946), Newtown (1944), Norfolk (1945), Norwalk (1946), Redding (1949), Somers (1949), Sprague (1945), Stonington (1949), Trumbull (1945), Waterbury (1945), and Wethersfield (1944).

The specimens upon which these records are based are indefinite as to form and mostly sterile. All have been tested for strepsiline with positive results and the same thing is true of the specimens listed under the following forms:

Cladonia strepsilis f. compacta Anders (1932, p. 163). Avon (1949), Beacon Falls (1928), Bethany (1945), Norfolk (*Hale*, 1949), Prospect (1949), and Southington (*Bunn*, 1945).

Cladonia strepsilis f. coralloidea (Ach.) Vainio (1930, p. 489). Manchester (1945), Meriden (*Johnson*, 1944), Norfolk (1945), Southington (*Bunn*, 1944), and South Windsor (1945).

Cladonia strepsilis f. glabrata Vainio (1930, p. 488). East Lyme (1944).

Cladonia strepsilis f. subsessilis Vainio (1930, p. 489). Brookfield (1944), Killingly (1945), Meriden (*Johnson*, 1945), Southington (*Bunn*, 1945), South Windsor (1945) and Tolland (1944).

Group Ochroleucae

Cladonia piedmontensis Merrill (1930, p. 490).

Usnic acid is the only lichen-substance that has been demonstrated in this species (see Asahina, 1943, p. 244, and Evans, 1944, p. 616). The following records are based on sterile specimens: Bozrah (1945), Meriden (*Johnson*, 1943), and Vernon (1946). These, as well as the specimens listed under the following forms, have been tested for usnic acid and have yielded the characteristic crystals of this substance.

Cladonia piedmontensis f. epiphylla Robbins (1935, p. 57). Groton (*Mrs. Upson*, 1944).

Cladonia piedmontensis f. lepidifera (Vainio) Robbins (1930, p. 491). Bethany (1944), Glastonbury (1944), Meriden (*Johnson*, 1945), Newington (1944), Southbury (*Johnson*, 1944), Southington (*Bunn*, 1944), Torrington (1944), and Wethersfield (1944).

Cladonia piedmontensis f. obconica Robbins (1930, p. 491). East Granby (1949) and Southington (*Bunn*, 1944).

Cladonia piedmontensis f. squamosissima Robbins (1932, p. 164). Southington (*Bunn*, 1949).

Cladonia piedmontensis f. squamulosa Robbins (1930, p. 491). Bethany (1944), East Granby (1949), Montville (1947), and Southington (*Bunn*, 1944).

At the close of 1943 there were 9 towns in Connecticut from which no *Cladoniae* had been reported. This gap has now been filled, and specimens of the genus from each of the 169 towns in the state are now preserved in the herbarium of Yale University. Owing to the careful exploration of Mr. James M. Bunn, the town of Southington, with 45 species to its credit, stands at the head of the list. In this single town, therefore, all but 15 of the 60 species known from the entire state have been found. In the town of Meriden, which follows closely with 41 species to its credit, Mr. Harry L. Johnson has been especially active and has discovered a number of unusual species and forms. North Branford, with 40 species, comes next in order, followed by Madison (39 species), Salisbury (38), Branford (35), North Haven (34), Cheshire and Killingworth (33 each), Norfolk and Wallingford (32 each), Goshen and Guilford (31 each), and Glastonbury and Old Saybrook (30 each).

At the close of 1943 *C. cristatella*, which at that time had been reported from 134 towns, was apparently the most abundant species in the state, although *C. subtenuis*, listed from 133 towns, was a close second. The latter species, since reported from 15 additional towns, now heads the list with 158 towns to its credit. In other words *C. subtenuis* has been collected in all but 11 towns in the state. The following species are not far behind in order of abundance: *C. Grayi* (reported from 157 towns), *C. bacillaris* (from 151), and *C. cristatella* (from 150), The following come next in order: *C. pleurota* (148 towns), *C. furcata* (134), *C. subcariosa* (127), *C. coniocraea* (119), *C. apodocarpa* (106), *C. ne-*

moxyna (102), *C. caespiticia* (101), *C. submitis* (98), *C. uncialis* (95), *C. capitata* (91), and *C. verticillata* (88).

The rarities of the Connecticut flora, each known from fewer than 10 towns apiece, are essentially the same as at the close of 1943. A list of these rarities follows: *C. alpestris* (reported from 3 towns), *C. Beaumontii* (from 1), *C. carassensis* (1), *C. cariosa* (3), *C. cenotea* (4), *C. cornutoradiata* (2), *C. decorticata* (2), *C. deformis* (2), *C. didyma* (6), *C. digitata* (1), *C. glauca* (3), *C. major* (4), *C. merochlorophaea* (1), *C. mitis* (1), *C. Norrlini* (3), *C. scabriuscula* (2), and *C. turgida* (6).

Several species of *Cladonia* belonging to the flora of the northeastern United States have not yet been found in Connecticut. Some of these, such as *C. alpicola* (Flot.) Vainio, *C. amaurocraea* (Floerke) Schaer., *C. cornuta* (L.) Hoffm., *C. cyanipes* (Sommerf.) Nyl., and *C. gonecha* (Ach.) Asahina, are distinctly northern and are hardly to be expected south of the mountains of Maine, New Hampshire and Vermont. Others, such as *C. leporina* Fr., *C. polycarpia* Merrill, and *C. Ravenelii* Tuck., are southern and have not been found north of New Jersey; *C. polycarpia*, in fact, is not definitely known north of Virginia. It would not be surprising, however, if one or more of the following species should be discovered within the state: *C. acuminata* (Ach.) Arn., *C. calycantha* Del., *C. crispata* (Ach.) Flot., *C. degenerans* (Floerke) Spreng., *C. floridana* Vainio, and *C. impexa* Harm. The first of these is already known from Vermont and Pennyslvania; the second from the Cape Cod region, eastern Long Island, New Jersey, and Pennsylvania; the third from Vermont, New York, and Pennsylvania; the fourth from Vermont, New York, and Pennsylvania; the fifth from the Cape Cod region, eastern Long Island, New Jersey, and Pennsylvania; and the sixth from the Cape Cod region and New Jersey. Two of these species, *C. crispata* and *C. impexa*, have already been reported from Connecticut (1930, pp. 386 and 430), but the records were based on incorrect determinations (1938, p. 9, and 1944, p. 569).

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Explanation of Plate 1161

Fig. 1. C. farinacea, Southington, Connecticut, *J. M. Bunn*, 1945, No. 6447. Fig. 2. C. farinacea, Punta Arenas, Patagonia, *P. Hariot*, 1882 (?), No. 15667, type of *C. furcata* γ. *scabriuscula* f. *farinacea* Vainio. Fig. 3. C. cylindrica, Southington, *J. M. Bunn*, 1945, No. 6450. All × 1½. The writer wishes to thank Dr. John R. Reeder for the photographs used in the preparation of this plate.

A SUBSTITUTE FOR FORMALDEHYDE AND ALCOHOL IN PLANT COLLECTING

H. E. Moore, Jr.

While preparing for three months of field work in Mexico during the fall of 1949, I was referred by Dr. George H. M. Lawrence of the Bailey Hortorium to a note by Swingle (Bot. Gaz. **90:** 333–34, 1930) concerning the use of water soluble oxyquinoline sulphate (now sold as hydroxyquinoline sulphate) as a field preservative for plants on the Humbert-Swingle Madagascar plant exploration trip of 1928. The agent was described as a practically non-poisonous, non-corrosive disinfectant with high antiseptic and preservative properties but low germicidal action. It lacks the disagreeable pungent odor and the drying action on the skin of formaldehyde and is transportable in powder form, thereby eliminating the bulk of either alcohol or formaldehyde.

Schultes has discussed the use of formaldehyde (Rhodora **49:** 54–60, 1947) and Hodge of alcohol (op. cit. 207–210) by the plant collector in the field but apparently the suitability of hydroxyquinoline sulphate has been overlooked. Previous struggles with the discomfort of acrid fumes and rough dry hands and the inconvenience of transport attendant on the use of formaldehyde in the technique described made the substitution of a convenient and satisfactory chemical in powder form seem worth further trial. Consequently a stock of packets was made, each containing 10 grams of the material or sufficient to make a quart or liter of

approximately 1 per cent solution upon addition to water. Swingle noted that as low as a 0.1 per cent solution is satisfactory for stopping bacterial action with ordinary plant material and 0.5 per cent solutions have been used for preserving study material in liquid at the Bailey Hortorium but the stronger concentration was thought safer for field trial.

Unfortunately for a general testing, most collecting was done in areas where presses could be placed over heat at night but a sample bundle of one day's collecting was treated with a 1 per cent aqueous solution of hydroxyquinoline sulphate, sealed and carried for a week before putting into press. The method used was essentially that described by Schultes, substituting the present agent for formaldehyde, and the results were most satisfactory. The solution has a slight but not unpleasant odor and had little effect on the skin during trial so that working with bare hands is feasible.

In addition to the treating of specimens, palm fruits and flowers were preserved in vials or jars using the same concentration and after three months have shown no sign of deterioration. Study material previously mentioned, consisting of flowers and fruits collected fresh and placed in solution during the summer months of 1949, was in satisfactory condition for laboratory work in the winter months, suggesting a broad applicability. However, Swingle's warning that a precipitate is formed when the solution comes in contact with ferrous metals must be repeated. A plastic, cork or other non-metallic capping for jar or vial eliminates such difficulty.

It is suggested that hydroxyquinoline sulphate be given further consideration and trial for it thus far upholds Swingle's recommendation of it as a most acceptable general preservative for use of the plant collector. Because of the low cost, ease of transport as a dry powder, rapidity of preparation with water and apparent lasting quality as a preservative it appears to be an ideal substitute for formaldehyde and alcohol where these are now used by the collector and its use eliminates obnoxious fumes, drying and cracking skin and wasteful disposal of potable alcohol.

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SUBSPECIFIC VARIATION IN SPOROBOLUS CRYPTANDRUS

ELIZABETH KIRK JONES AND NORMAN C. FASSETT

A. Spikelets 1.4–2.0 mm. long; grains 0.6–0.9 mm. long.....
.....*S. cryptandrus* ssp. *typicus.*
B. Spikelets densely clustered (11–20 spikelet bases occur in a 3 x 4 mm. rectangle laid on the panicle branch)..var. *typicus.*
B. Spikelets loosely arranged (5–12 spikelet bases occur in a 3 x 4 mm. rectangle laid on the panicle branch)..var. *occidentalis.*
A. Spikelets 2.0–3.0 mm. long; grains 1.0–1.2 mm. long.....
.....*S. cryptandrus* ssp. *fuscicolus.*

SPOROBOLUS CRYPTANDRUS (Torr.) Gray, ssp. **typicus** var. **typicus.** Based on *Agrostis cryptandra* Torr. Ann. Lyceum Nat. Hist. N. Y. vol. **1:** 151. 1824.

The type specimen of *S. cryptandrus* from the Canadian River in Texas or Oklahoma has been examined by Mr. Jason Swallen of the Smithsonian Institute who reports that it belongs to this phase of the species in which the spikelets are small, 1.4–2.0 mm. long, and densely crowded in the panicle (a rectangle 3 x 4 mm. placed on a branch of a pressed specimen covers the bases of 10–20 spikelets); the second glume is shorter than the lemma; the grains are 0.6–0.7 mm. long and 0.3–0.4 mm. wide, reddish brown at maturity. The mature light-green inflorescences, stems, sheaths are steaked with purple to red.

This is the more southwestern phase of the species occurring from Washington to Arizona; Montana, Wyoming, Colorado; South Dakota, Nebraska, Kansas, Oklahoma, Texas; southern Minnesota, Iowa, Missouri; southern Wisconsin, Illinois and extreme northwestern Indiana.

SPOROBOLUS CRYPTANDRUS (Torr.) Gray, ssp. TYPICUS var. **occidentalis** var. nov., spiculis 1.4–2.0 mm. longis, laxius dispositis in ramulis paniculae. TYPE: Bars of Snake River, Ballard's Landing (about three miles northeast of Homestead, Baker Co.), Oregon, July 8, 1899, *Cusick 2222* (in the United States National Herbarium). ISOTPYES are in Washington State College and Missouri Botanical Garden.

This is the northwestern phase of the species occurring in British Columbia, Saskatchewan; Washington, Oregon, Idaho; Montana, Wyoming, and Colorado.

The spikelets are 1.4–2.0 mm. long, loosely arranged in the panicle (5–12 spikelet bases occur in a 3 x 4 mm. rectangle); the second glume is shorter than, rarely equalling the lemma; the grains are 0.8–0.9 mm., rarely 0.6 mm. long, and 0.3–0.5 mm. wide, reddish-brown at maturity. The inflorescences, stems, sheaths may be tinged with purple to red or wholly light-green.

Sporobolus cryptandrus (Torr.) Gray, ssp. **fuscicolus** (Hook.) comb. nov. *Vilfa tenacissima* var. *fuscicola* Hook. Fl. Bor.-Am. **2:** 239. 1939.

This is the northern and northeastern phase of the species occurring locally along the Great Lakes and eastward to western Quebec and Massachusetts; westward through Wisconsin, Minnesota, North Dakota, Montana to Puget Sound; southward to Iowa and Missouri, South Dakota, Nebraska, Kansas, Wyoming and northern Colorado.

The spikelets are large, 2.0–3.0 mm. long, rather loosely arranged in the panicle (a rectangle 3 x 4 mm. placed on a branch of a pressed specimen covers the bases of 3–10 spikelets); the second glume usually equals or exceeds the lemma; the grains are 1.0–1.2 mm., rarely longer, 0.6–0.8 mm. wide, and commonly yellowish-brown at maturity. The fertile inflorescences are deep lead-green at maturity; the staminate panicles are olive-green.

The ranges of ssp. *fuscicolus* and var. *typicus* overlap considerably. In such cases where the two occur in the same site, the two entities may remain distinct or intermediates of various types may occur. A study of the recombinations in the region of overlap is now in process.

Department of Botany, University of Wisconsin.

Two new States for Tridens strictus.—In 1940 this grass, *Tridens strictus* (Nutt.) Nash [Syn.: *Triodia stricta* (Nutt.) Benth.] was collected in southwestern Georgia (Dougherty County, *Duncan* 3091, 19 Sept., 1940. Flat, open, compact, sandy loam soil); but the fact that this was a new state-record escaped my notice. Exactly nine years later the species was collected in South Carolina (McCormick County, *Duncan* 10418, 19 Sept., 1949. Upland, pine-oak woods; gray, sandy loam soil; 3.1 miles S. W. of McCormick). I discovered that this *Tridens*

had not been reported for either South Carolina or Georgia. About a month later the grass was collected in northeastern Georgia (LINCOLN COUNTY, *Duncan* 10621, 9 October, 1949. Edge of field, 2.2 miles N. E. of Lincolnton) and again in MCCORMICK Co., S. C. (*Duncan* 10622) about eight miles east of the previous station.

A search was made in several eastern herbaria for other collections of this grass from Georgia and South Carolina but no additional records were found. More Georgia records, however, were discovered from other sources. *Venard and McDowell* of Atlanta, Georgia, collected it in FULTON COUNTY (No. V-458. 7 Sept. 1947. Banks of Peachtree Creek opposite 435 Woodward Way). Dr. Robert F. Thorne, State University of Iowa, also provided some county records from his abundant collections of the last few years from southwestern Georgia. They are: SEMINOLE COUNTY, *Thorne and Muenscher* 8756, Sealy Plantation. BAKER COUNTY, *Thorne* 7051, 1 mile northeast of Newton.

The localities reported here, 5 counties in Georgia and one in South Carolina, constitute a considerable addition to the known distribution of *Tridens strictus*. The known distribution now includes Kansas, Missouri, Tennessee, North Carolina, and all states to the south except Florida. It is most abundant in the western part of this range and is probably a recent adventive in several localities in Georgia and eastward.—WILBUR H. DUNCAN, University of Georgia, Athens, Ga.

BRASSICA KABER (DC.) Wheeler, var. **stricta** (Čelakovsky) Shinners, comb. nov. *Sinapis arvensis* var. *stricta* Čelakovsky, Prodr. Fl. Böhm. **3:** 470. 1874 (according to O. E. Schulz, Pflanzenreich **70.** Heft, Fam. IV. 105: 123. 1919).

Pods appressed as in *B. nigra* (L.) Koch, but with long, tetragonally subulate beak (6–12 mm. in the specimens cited below, mostly without fully mature fruit) and 3-ribbed valves (often obscurely so) as in *B. kaber* (DC.) Wheeler, Rhodora 40: 306. 1938. Five Texas collections are in the Herbarium of Southern Methodist University. EDWARDS Co.: Substation No. 14, *V. L. Cory 44304*, May 19, 1944. HAMILTON Co.: about 10 miles south of Hamilton, *Eula Whitehouse 15389*, April 20, 1946. KAUFMAN Co.: 2.8 miles east of Elmo, *Cory 55510*, April 8, 1949. KERR Co.: 8 miles northeast of Kerrville, *Cory 51830*, April 28,

1946. Van Zandt Co.: 1½ miles west of Wills Point, *Lloyd H. Shinners 10830*, April 3, 1949.

Doubtless the plant occurs elsewhere in the United States, but has been mistaken for *B. nigra* because of its appressed pods. The above transfer is made with some hesitation, following the lead of Wheeler. Dr. Wheeler admits that his adoption of the name *Brassica kaber* in place of *B. arvensis* (L.) Rabenhorst (not *B. arvensis* L.) is not the result of taxonomic study, but merely of examination of the synonymy given by Schulz in Das Pflanzenreich—not necessarily an unimpeachably complete account of all possibly pertinent nomenclatorial data.—Lloyd H. Shinners, Southern Methodist University, Dallas, Texas.

Potamogeton oblongus, not P. polygonifolius.—

Potamogeton oblongus Viv. in Ann. Bot. i. 62 (1804). *P. polygonifolius* sensu Reichenbach, Ic. Fl. Germ. vii. 37 (1845) and later authors, not Pourret in Mém. Acad. Toul. iii. 325 (1788).

Mansfeld in Fedde, Repert. xlv. 209 (1938), summarizing the situation, concludes that *Potamogeton polygonifolius* belongs to *P. alpinus* Balbis (1804) and that the name *P. oblongus* must be used for the plant which has erroneously passed as *P. polygonifolius*.—M. L. Fernald.

Vol. 52, no. 616, including pages 61–76 and plates 1157–1160, was issued 12 April, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN } Associate Editors

Vol. 52. June, 1950. No. 618.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

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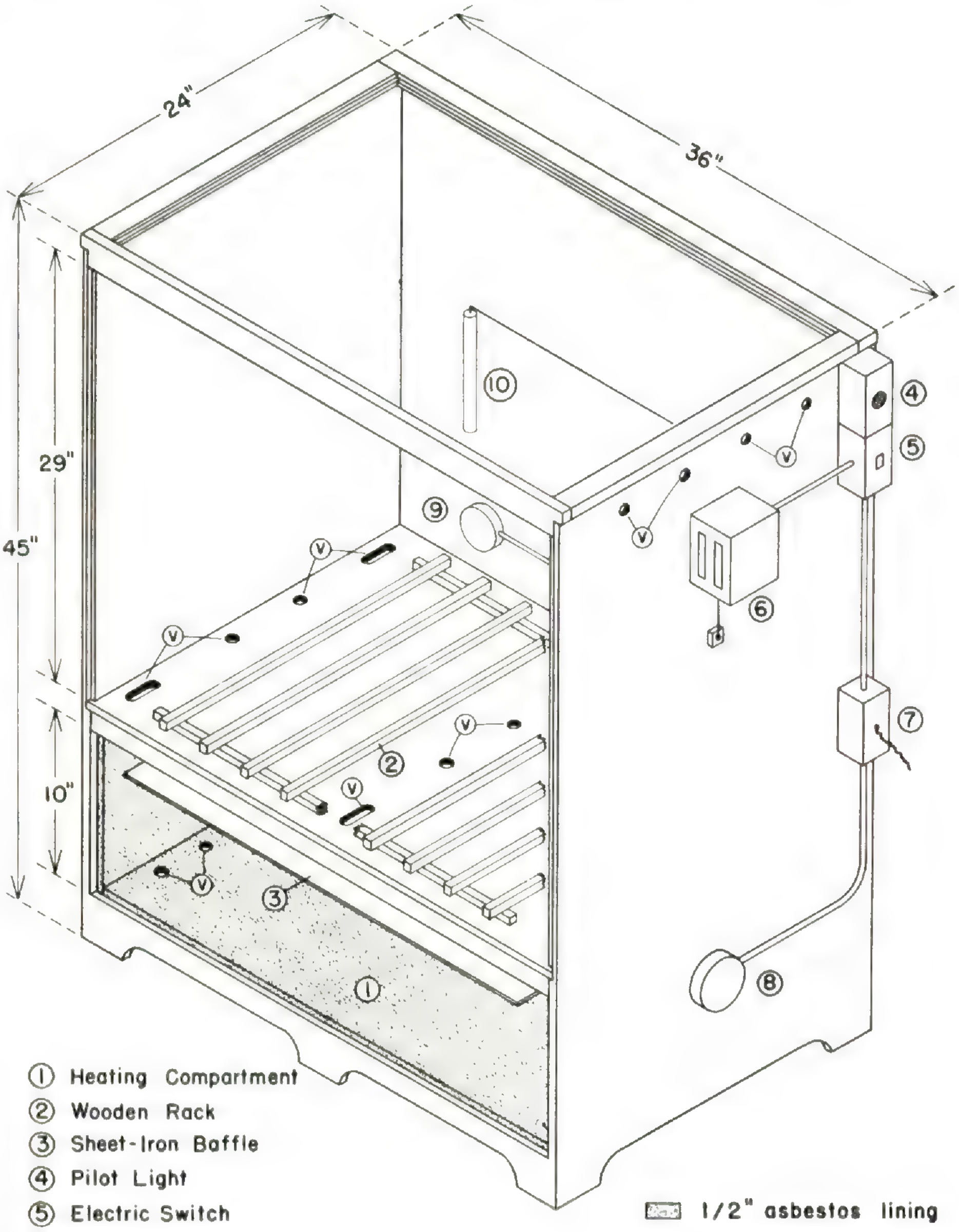
GRAY HERBARIUM of HARVARD UNIVERSITY, Cambridge 38, Mass.

AN ELECTRICAL DRIER FOR HERBARIUM SPECIMENS



① Heating Compartment
② Wooden Rack
③ Sheet-Iron Baffle
④ Pilot Light
⑤ Electric Switch
⑥ Mercury Thermostat
⑦ Outlet Box and Cord
⑧ Box to Heating Unit
⑨ Firomatic Thermal Switch (connects with ⑦)
⑩ Element (connects with ⑥)

▭ 1/2" asbestos lining
Ⓥ Ventilation holes

Full-size doors are required for top, drying-compartment, and heating compartment; walls are 1/2" plywood, 5 ply.

Drawn by Jameson MacFarland
Clark University, 1949

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. June, 1950 No. 618

AN ELECTRICAL DRIER FOR HERBARIUM SPECIMENS

BURTON N. GATES

CONTRIVANCES of field botanists, with lanterns and oil stoves to supply heat to dry their specimens have been many and various. These devices could not be used safely in a wooden laboratory. Moreover, circumstances at Clark University made it inconvenient to dry specimens out-of-doors, in the presence of sunlight and an abundance of circulating air, which readily carries off the evaporating water from the plants. Drying indoors has been accompanied by discoloration and mildew, most difficult to combat during humid, stagnant periods and at times tediously slow. Working under these conditions, it became increasingly clear that there must be a better and quicker laboratory means for preparing herbarium specimens. Quite naturally it was reasoned, electricity for heat should be adaptable and without a fire hazard.

After consideration with the University electrician and carpenter, of the difficulties to overcome and the results desired to accomplish, they produced an electrical drier. It is essentially a large wooden box (it might well be of insulated metal) with two full-width doors (no hinges) in front and one forming the top. There are two compartments: the one below for the heat-unit (called in the trade a "space-heater"); that above (the larger) for drying two piles of specimens. Between these compartments, the floor is constructed to support at least 250 pounds, allowing for ample pressing weights sometimes amounting to approximately 100 pounds on each pile of specimens. The piles of pressing specimens are elevated on a rack of $\frac{7}{8}$ inch strips, in order to prevent direct conduction of heat into the piles.

The electrical equipment used for heat is simple, consisting of a space-heating unit with thermostatic control.[1] In addition is a Firomatic Thermal Switch, "T.S.100", which will cut out the current completely in case of overheating due to the failure of the thermostat and in case of fire.

The heating compartment, as a safety measure is insulated with asbestos board. As a further precaution against fire, and also to diffuse the heat generated by the unit, a sheet-iron baffle is suspended above the space-heater. This was found necessary to minimize direct heat-conduction, forming an especially hot-spot in the floor beneath the pressing piles.

Mention of measurements is unnecessary inasmuch as details are shown on the accompanying drawing. The construction may be as simple or as varied as the available materials and the ingenuity of the botanist suggest. Two prime requisites are: absolute safety from fire and reasonable control of the ventilation and the temperature. Also, it is desirable to have ample capacity, with space for at least two pressing-piles, each of at least seventy-five specimens, which should accommodate material of more than one collector.

The circulation of heat is by convection only[2]. Entering the heating chamber from below, the air passes upward through a series of ¾ in. auger holes, together with a few slots of the same diameter. The passages, to allow for the expanding air, increase progressively from the intake to the outlet at the top of the drier. Freedon of convection of air into and from the drying compartment appears particularly important. To increase and facilitate this freedom of passage, it has been suggested that a grating beneath the pressing piles would be preferable to the floor with its ventilating holes and slots as now used. Surely there appears no objection to it, except perhaps that it might be a more costly construction. The efficiency of the apparatus appears to be best, if it is installed in a well ventilated room, relatively free from dampness.

[1] Since there are various temperature-control mechanisms designed to accomplish different results, it is advisable to consult an electrician before purchasing. The controller installed is Minneapolis-Honeywell T415A, with a differential. Set to maintain 110° F., this degree is not exceeded. The differential allows this temperature to drop a few degrees before the current is again cut in and the temperature raised to 110° F

[2] An electric fan might be installed to advantage, it has been suggested, in order to obtain speedier movement of the vapor-laden air.

For two years since the initial pressing, the apparatus has given outstanding satisfaction. Colors of both chlorophyll-bearing parts and of inflorescences have been retained, drying surprisingly natural and in many instances superb. Aquatics, most ferns, Cariceae and some grasses, among other plants low in water content, have usually dried overnight; material with more water content has required only twenty-four to approximately forty-eight hours. The drying-time is apparently directly related to the water content of specimens, to the texture, to the atmospheric moisture (humidity) and to the temperature and ventilation within the drier.

It is becoming more apparent why some specimens consume more time to dry than others. Recently, it has been observed that fleshy specimens with glaucum appear to be retarded in drying; in growth, glaucum is said to conserve the plant-moisture. In drying *Arisaema atrorubens* (glaucus) and *Arisaema Stewardsonii* (lacking glaucum) in the same pressing, the *A. Stewardsonii* dried promptly and well, while *A. atrorubens* was slow to dry, requiring more attention to prevent discoloration and crinkling. It is pleasing to find that this genus, ordinarily difficult to press without loss of color, may be preserved with nearly complete natural color, together with much of the glaucum of *A. atrorubens*. Success has also been attained in preserving to some extent, the corrugation of the tube of the spadix of *A. stewardsonii*.

Experience has demonstrated the necessity for efficient pressing materials (pads and corrugated pressing-boards or ventilators). Amelanchier laevis should press easily and dry quickly with clear white petals and slightly rose-tinted leaves. Difficulty was encountered with a specimen recently taken from the drier; it was of good color and quite satisfactory for about two inches from the margins of the pressing-folder. Inside this area, discoloration increased progressively to the center where there was mold. The pressing-boards or ventilators were old and flattened. Their centers probably trapped and retarded the evaporation of the moisture of the plant juices, encouraging growth of molds. Chemical changes within the plant doubtless took place resulting in discoloration of both leaves and flowers. This experience has demonstrated that a pressing-board uncrushed and in good con-

dition would have successfully liberated the moisture, and permitted even drying.

It is no slight satisfaction to find that it is usually unnecessary to change wet pressing-pads and ventilators. Furthermore, as they come from the drier, they are usually ready for re-use without resorting to prolonged spreading in the sun, airing and drying.

After obtaining conspicuously good results with the thermostatic control set at 110° F. without first having known what the optimum conditions for the job might be, an attempt was made to analyze results, in order to determine whether the methods could be improved. Very little information was discovered in print[3]. Practical collectors, however, were quick to warn against too rapid drying, at too high temperature; no one seemed to know the optimum or the maximum safe temperature. High temperature is said to damage tissues and to shorten the life in the herbarium. It has been stated as the cause of the embrittlement of specimens. Professor Fernald[4] refers to the injury done, in his experience, by drying with extreme heat supplied from an engineroom[5] on shipboard during a collecting excursion. Dr. Karl M. Wiegand, explains Professor Fernald, also devised a drying means above the motor of an automobile[6] which he used while collecting. Each method, it is alleged, resulted in fragile specimens; that is embrittlement. Graphically, Professor Fernald continues to explain that the waxy coating (glaucum) of Dr. Wiegand's Magnolia virginiana was melted, completely altering the appearance and obliterating a diagnostic character of the species. Professor Fernald does not indicate the degree of heat utilized, but doubtless it was much higher than he customarily used in pressing.

In an effort to arrive at the normal or perhaps an optimum temperature, the established custom at the Gray Herbarium may

[3] Quite similar in many respects to the electric drier, is the cabinet, seemingly adaptable also to drying specimens, described by Hugh O'Neill, Rhodora, 1938, vol. 70, pp. 1–4, illus., titled, "Heat as an Insecticide in the Herbarium" which utilized a temperature of 170° F. with alleged safety. It resulted after 4–6 hours, in a temperature of 140° F. in the center of the bundles being processed.

[4] M. L. Fernald. Injury to Herbarium Specimens by Extreme Heat. Rhodora, vol. 47, pp. 258–260.

[5] Engineroom temperatures have been estimated by experienced observers as around 120° F. with a probable reduction of the temperature as the air escapes.

[6] Temperatures over an automobile engine would not normally exceed 140° F. and might be less, depending somewhat on driving conditions and variation of the atmospheric temperature.

be considered. There, as with other collectors, it is accepted practice, to place on end, on the cement sidewalk, in full sun, strapped bundles of specimens prepared between corrugated board ventilators. It has been ascertained[7] that the possible range of temperature in Cambridge, on the cement or stone work in front of the entrance to the Gray Herbarium, on favorable drying days, in full sunlight, may range approximately between 120° and 140° F. This most satisfactory estimate is supported by an observation by the present writer, of surface soil temperature about the crowns of Sempervivum growing in a similar situation in Worcester, Massachusetts. In the top half inch of sand, the surface temperature was read at 120° F.

In the drying of plant specimens, a physicist has interpreted a factor, probably quite generally overlooked, but which in reality is the key to the process. Varying with the nature and the bulk of the plant specimens to be dried, is an appreciable amount of water within the tissues. As the water vaporizes, it is picked up and carried off by the air. Almost unbelievable is the physical fact, that one gram of water removed from the specimens, vaporized and expanded, increases in volume one thousand, six hundred times, approximately; that is, a gram of water expands as vapor to about 1.6 liters.[8] The removal of this vast bulk of vaporized water by means of the air is the drying process. Varying with the nature of the material in a given pressing, there may be several grams of water to be picked up and carried off. Obviously, in order to accomplish this readily, the drier should provide free, constant and voluminous passage of air. Conversely, stagnation of the moist, warm air about the succulent plant specimens, in effect slowly cooks them in their own juices and with the accompanying chemical changes, presumably causes discoloration and fading. Such a condition induces and promotes growth of molds, a condition decidedly detrimental to the appearance and life of herbarium specimens. Molds appear to break down the

[7] An appreciated letter, December 30, 1948, from P. H. Kutschenreuter, Meteorologist in Charge, U. S. Weather Station, Logan International Air Field, East Boston, Mass., who interviewed in regard to the problem, Dr. Charles F. Brooks of Harvard University. From his experiments along this line, Dr. Brooks concluded that "under light wind conditions in full sunlight, maximum temperatures on the order of 140° F. were observed; under moderate wind conditions, 120° F." These approximations are of course subject to numerous physical and meteorological phenomena.

[8] Air temperature involves another meteorological axiom. The higher the temperature of the air the greater may be the volume of water-vapor absorbed by it.

plant tissues, being the agent responsible for embrittlement. The sooner, therefore, that the moisture is eliminated, the quicker the drying and the better the resulting specimens. In the construction of the drier, this physical principle of the extraordinary expansion of water, as vapor, should be utilized, with ample provision for the escape of the vapor-laden air.

From the detached data available, as well as by the use of the drier, an approach has been made toward understanding how herbarium specimens may be dried advantageously. An over-high temperature with the consequent over-quick drying and the possible resultant embrittlement of specimens is to be avoided; the over-high temperature it is thought may begin at about 140° F. The electric drier has been operated thus far with much satisfaction at a presumed safe, maximum temperature of 110° F., thermostatically controlled. This may be below the ultimate optimum temperature; near 120° F. is suggested as doubtless safe and very likely efficient. Physical factors point directly to the utilization of as high a temperature as possible. Ideal conditions seem to be temperature and abundant air-circulation as observed out-of-doors in the sun. Outdoor conditions, however, are fluctuating; there are days and circumstances when favorable conditions cannot be available. The electric drier can supplement, if not replace, outdoor drying.

BIOLOGY DEPARTMENT, CLARK UNIVERSITY, Worcester, Massachusetts.

DESMODIUM: PRELIMINARY STUDIES—III[1]

BERNICE G. SCHUBERT[2]

IN the preparation of a treatment of the genus *Desmodium* for the eighth edition of Gray's Manual it has been necessary to make certain nomenclatural changes, describe a few previously unrecognized members of the genus and realign some relationships among the North American species. I had hoped by this time to present a comprehensive study of the species of *Desmodium* of the United States and Mexico, but other duties preclude its completion now. This shorter paper, however, the third of the series of Preliminary Studies, will precede by only a brief interval, I trust, the first of the new series of Monographic Studies in Desmodium.

Although *Desmodium* was conserved over the name *Meibomia* by the International Botanical Congress of Vienna in 1905,[3] Schindler, in 1934, proposed in his paper "*Desmodium* und *Meibomia*"[4] to maintain both names, assigning to the genus *Meibomia* all the species in the Manual range except *D. nudiflorum*, *D. glutinosum* and *D. pauciflorum*. I shall discuss Schindler's thesis in a later paper, but I do not propose to maintain *Meibomia* as a distinct genus.

For the purpose of seeing more clearly the relationships between species I have arranged them in Series which seem from all observations to be perfectly natural species-groups. The series are described here, but are not in this paper assigned to their respective sections.

A. MISCELLANEOUS NOTES

DESMODIUM,

Ser. **Americana**, ser. nov., herbae, ascendentes vel erectae; staminibus monadelphis; lomentorum suturo superiori plus

[1] Desmodium: Preliminary Studies—I, in Contrib. Gray Herb. cxxix. 3–31 (1940); Desmodium: Preliminary Studies—II, op. cit. cxxxv. 78–115 (1941).

[2] I am very grateful to those in charge of the following herbaria for their kindness in making available materials for my study: Chicago Natural History Museum (C); Florida Agricultural Experiment Station, Gainesville (Fla); Missouri Botanical Garden (Mo); New York Botanic Garden (NY); Academy of Natural Sciences, Philadelphia (Phila); U. S. National Herbarium (US). Specimens cited without indication of the herbarium in which they are found are all in the Gray Herbarium.

[3] Int. Rules of Bot. Nomencl. 82 (1906).

[4] Schindler in Rep. Spec. Nov. xx. 136 (1924).

minusve recto, isthmis angustis, sinibus altis, articulis magnis asymmetricisque.

Ascending or erect herbs; the loments with an essentially straight upper suture, narrow isthmi, deep sinuses and large somewhat asymmetrical articles.

D. glutinosum (Muhl. ex Willd.) Wood is a representative species and may be taken as the TYPE of the series; the other members are *D. nudiflorum* (L.) DC. and *D. pauciflorum* (Nutt.) DC.[1] In all other series considered in this paper the stamens are diadelphous (9 and 1). This is a very interesting group with its closest relatives in Asia. Our members have always been thought to be confined to the eastern United States (two of them with a few stations in Canada). A single collection by C. G. Pringle from the state of Nuevo Leon in Mexico and recent collections of C. H. Muller, F. G. Meyer & D. J. Rogers, E. Hernandez X. & A. J. Sharp, and Kenoyer & Crum from Nuevo Leon, Puebla and San Luis Potosi, however, add *D. glutinosum* to that already long list of species known in the eastern United States which are found also in Mexico and, in many cases, in Central America.

Ser. **Stipulata**, ser. nov., prostratae vel erectae; stipulis conspicuis, ovato-attenuatis et in basi cordatis vel semicordatis.

These are prostrate or erect herbs with conspicuous ovate-attenuate stipules, cordate or semicordate at the base. *D. canescens* (L.) DC. may be taken as the TYPE-SPECIES.

The related species in the series are *D. illinoense* Gray, *D. rotundifolium* DC. and *D. ochroleucum* M. A. Curtis. The first two species are upright and coarse and rather common in their areas; the latter two are prostrate plants, *D. rotundifolium* more or less widespread, but not abundant and *D. ochroleucum* one of our rarer species of the southeast.

Ser. **Pauciarticulata**, ser. nov., herbae, bracteis floribusque parvis, lomentibus 1–3(–4)-articulatis, articulis parvis vel mediocribus.

More or less spreading herbs with small bracts and flowers and few-articulate loments with small or medium-sized articles. *D. ciliare* (Muhl. ex Willd.) DC. may be taken as the TYPE-SPECIES.

Other members of the series in our flora are *D. sessilifolium*

[1] This series was defined by Schindler in Rep. Spec. Nov. xxii. 260 (1926). Although he there listed the three American species constituting the group he did not name it.

(Torr.) T. & G., *D. tenuifolium* T. & G., *D. strictum* (Pursh) DC., *D. rigidum* (Ell.) DC., *D. marilandicum* (L.) DC. and *D. lineatum* DC.

Ser. **Longibracteata**, ser. nov., herbae robustae, bracteis primariis magnis conspicuisque, floribus magnis et lomentis brevi-stipitatis.

Stout herbs with long stipules, large conspicuous, but early-deciduous, primary bracts, large flowers and short-stipitate loments. *D. canadense* (L.) DC. is a representative species which may be considered the TYPE of the series.

The other member in our flora is *D. cuspidatum* (Muhl. ex Willd.) Loud.

Ser. **Stipitata**, ser. nov., herbae robustae cum bracteis primariis floribusque minoribus et lomentis longiore stipitatis quam in serie precedente.

Usually stout herbs with the primary bracts and the flowers smaller than in the *Longibracteata*, but the loments much longer-stipitate.

The series includes some of the most confusing species-complexes in our flora, which are not yet worked out to the author's satisfaction, although in the case of *D. viridiflorum* and its nearest allies the problem seems to be much clarified. *D. viridiflorum* (L.) DC. may be considered the TYPE of the series which also includes from the Manual-range *D. Nuttallii* (Schindl.) Schub., *D. Fernaldii* Schub., *D. glabellum* (Michx.) DC., *D. paniculatum* (L.) DC., *D. perplexum* Schub., *D. humifusum* (Muhl.) Beck and *D. laevigatum* (Nutt.) DC.

The following new applications and nomenclatural changes are necessary but seem to need little discussion beyond their bibliographic records. Since *D. cuspidatum* is being taken up for *D. bracteosum* of ed. 7 rather complete synonymy is given for it as well as for its variety, where an actual nomenclatural change is involved.

D. GLUTINOSUM (Muhl. ex Willd.) Wood. The use of this name rather than *D. acuminatum* (Michx.) DC. was discussed by me in RHODORA xliv. 279 (1942). *D. glutinosum* is used rather than *D. grandiflorum* of ed. 7 since the latter was a misapplication. See references to the latter name under *D. cuspidatum* in this paper.

Forma **Chandonnetii** (Lunell) Schub., stat. nov. *Meibomia grandiflora* (Walt.) Ktze., var. *Chandonnetii* Lunell in Am. Midl. Nat. ii. 128 (1911). *D. acuminatum* (Michx.) DC., forma *Chandonnetii* Fassett in Rhodora, xxxviii. 189 (1936).

Forma **unifoliolatum** (Schub.) Schub., comb. nov. *D. acuminatum* (Michx.) DC., forma *unifoliolatum* Schub. in Rhodora, xxxix. 98 (1937).

D. rotundifolium DC., forma **glabratum** (Gray) Schub., stat. nov. Var. *glabratum* Gray, Man. ed. 5, 135 (1867).

D. cuspidatum (Muhl. ex Willd.) Loud., Hort. Brit. 309 (1830) [incorrectly attributed to DC.]; Torr. & Gray, Fl. N. Am. i. 360 (1838); Fernald & Schubert in Rhodora l. 203 (1948) [discussion]. *Hedysarum cuspidatum* Muhl. ex Willd., Sp. Pl. iii^2. 1198 (1802). *D. bracteosum* (Michx.) DC., *β. cuspidatum* (Muhl. ex Willd.) DC., Prod. ii. 329 (1825). *Meibomia cuspidata* (Muhl. ex Willd.) Schindl. in Rep. Spec. Nov. xx. 140 (1924). *Hedys. bracteosum* Michx. Fl. Bor.-Am. ii. 73 (1803). *D. bracteosum* (Michx.) DC., Prod. ii. 329 (1825); Robinson & Fernald in Gray, Man. ed. 7, 520 (1908); Fassett in Rhodora xxxviii. 96, 97 (1936) et in Legum. Pls. of Wisc. 96 (1939). *M. bracteosa* (Michx.) Ktze., Rev. Gen. i. 195 (1891). *D. bracteatum* Loud., Hort. Brit. 309 (1830) [incorrectly attributed to DC. and undoubtedly referable here]. *Hedys. grandiflorum* Walt. Fl. Carol. 185 (1788) non Pall. 1773. *D. grandiflorum* (Walt.) DC., Prod. ii. 338 (1825). *M. grandiflora* (Walt.) Ktze., Rev. Gen. i. 196 (1891); Blake in Bot. Gaz. lxxviii. 277 (1924) [discussion]; Schindl. in Rep. Spec. Nov. xxii. 276 (1926) [discussion].

There has been considerable changing about of names for this plant but, as shown in the discussion of Walter's plant, *D. cuspidatum* is the name which must be taken up.

Var. **longifolium** (Torr. & Gray) Schub., comb. nov. *D. canadense* (L.) DC., *β. longifolium* Torr. & Gray, Fl. N. Am. i. 365 (1840). *D. longifolium* Nutt. ex Torr. & Gray, l. c., nomen nudum in synon.; Smyth in Trans. Kans. Acad. Sci. xvi. 159 (1899). *M. longifolia* (Torr. & Gray) Vail in Bull. Torr. Bot. Cl. xxiii. 140 (1896). *D. bracteosum* (Michx.) DC., var. *longifolium* (Torr. & Gray) Robinson in Rhodora x. 34 (1908); Robinson & Fernald in Gray, Man. ed. 7, 520 (1908); Fassett, Legum. Pls. of Wisc., 96, fig. 49, pl. xii, figs. 62 a–e (1939).

B. Desmodium viridiflorum and its closest Allies

There has been in the past considerable uncertainty concerning some species of *Desmodium* in the southern part of the Manual-range and extending beyond it. Chiefly the misunderstanding has centered on *D. viridiflorum*, a rather close relative described

by Schindler in 1927 as *Meibomia Nuttallii*, *D. rhombifolium* and *D. floridanum* (not yet recorded from the Manual-range). Some of the difficulties were recognized by Torrey and Gray who, however, did not clarify the situation.

In the treatment of the genus prepared for the forthcoming edition of Gray's Manual I am maintaining *D. viridiflorum*, *D. Nuttallii* and *D. laevigatum*, as well as a new species, *D. Fernaldii*, and am treating *D. rhombifolium* as a nomen confusum. I have, fortunately, been able to see type-material or -photographs, or authentic material for all the species involved in this complex. Inasmuch as it has been concerned in questions of identity with species of the Manual-range I am also including *D. floridanum* in this detailed treatment and discussion.

a. Pedicels mostly short, 3–8.5 mm. long, stout; leaflets densely tomentose to glabrescent beneath (except on veins) but not glaucous.
  b. Leaflets moderately to densely tomentose beneath, soft-velvety to touch; upper surface moderately soft-pilose, not prominently reticulate.
    c. Terminal leaflet usually rhombic to deltoid, acute to cuneate or truncate at base, width generally at least two-thirds the length; articles chiefly rhomboidal (or the upper suture at least somewhat angled)..... *D. viridiflorum.*
    c. Terminal leaflet (except the uppermost) elliptic-ovate, mostly rounded at base, width about one-half the length; articles becoming rounded above (*i. e.* the upper suture curved rather than angled)..... *D. Nuttallii.*
  b. Leaflets glabrescent to moderately pilose and very strongly reticulate beneath.
    d. Leaves often unifoliolate, at least the terminal leaflet often truncate at base, moderately to abundantly pilose beneath; stipules mostly long-persistent, up to 10 mm. long, stipels up to 5 mm. long; articles large and with the upper suture mostly rounded..... *D. floridanum.*
    d. Leaves trifoliolate, narrowly ovate to rhombic, thick, uncinulate-pubescent along midrib and veins, otherwise essentially glabrous beneath; stipules early deciduous, 2–4 mm. long, stipels to 3 mm. long; articles with the upper suture chiefly angled..... *D. Fernaldii.*
a. Pedicels longer, 10–19 mm. long, slender; leaflets essentially glabrous to puberulent, glaucous beneath..... *D. laevigatum.*

D. VIRIDIFLORUM (L.) DC. Suffrutescent; stem erect, chiefly simple, up to 3 m. high, somewhat ridged and grooved, moderately to sparsely pilose (usually becoming less so in age) and uncinulate-pubescent with downwardly directed trichomes; leaves (rarely uni- to) trifoliolate, stipulate, petiolate; the striate ovate- to lance-acuminate stipules truncate at base, long-attenuate at apex, with the inner surface essentially glabrous to

puberulent and the outer appressed-pilose, 3–7 mm. long; the chiefly linear- to lance-attenuate ciliate stipels puberulent on inner surface, puberulent and somewhat pilose on outer surface, 0.5–4 mm. long; petioles ridged and grooved, spreading-pilose and uncinulate-pubescent, 0.5–6.5 cm. long; leaf-rachis similar, 1.1–2.8 cm. long; the stout petiolules very densely pilose, 3–5 mm. long; leaflets mostly rhombic (the terminal one sometimes deltoid, with truncate base), acute to acuminate or obtuse, width about two-thirds the length, moderately to abundantly spreading-pilose with short straight or hooked hairs (or with both types) and the veins somewhat impressed above, rather densely tomentose with the soft spreading white trichomes denser along midrib and veins beneath; terminal leaflet 5.2–11.8 cm. long, 3.6–8.8 cm. wide; lateral leaflets 4–10.2 cm. long, 2–6.5 cm. wide; inflorescence racemose-paniculate, its rachis prominently ridged and grooved, uncinulate-pubescent; primary bracts ovate-acuminate, striate, pilose on dorsal surface, ciliate, 2–4 mm. long; secondary bracts linear, ciliate, puberulent, not long-persistent, 0.5–1.5 mm. long; pedicels spreading uncinulate-puberulent and somewhat pilose, 3–8 mm. long; calyx patent-pilose throughout, upper bifid lobe 2–3 mm. long, central tooth of lower lobe 2.5–4.5 mm. long, the lateral lobes 2–4 mm. long; corolla said to turn green after anthesis, standard obovate, mostly retuse, cuneate at base, 5–8.5 mm. long, 3.5–8 mm. wide; wings more or less oblong (often somewhat obliquely so), short-clawed, 4.5–8.5 mm. long, 1.5–3 mm. wide; keel-petals falcate, truncate at apex, narrowed to very slender claw, 7–9 mm. long, 1–3 mm. wide above; loment stipitate, mostly (2–)4–5(–6)-articulate; stipe scarcely to moderately uncinulate-puberulent, 3–6 mm. long; articles more or less rhomboidal, moderately to densely uncinulate-pubescent on surfaces and sutures, 5–9 mm. long, 3.5–5 mm. wide.—Prod. ii. 329 (1835), as to name, not as to plant; Beck, Bot. N. and Middle States, 84 (1823) as to plant. *Hedysarum viridiflorum* L., Sp. Pl. 748 (1753). *Meibomia viridiflora* (L.) Ktze., Rev. Gen. i. 197 (1891); emend. Schindl., Rep. Spec. Nov. xxiii. 356 (1927). *Desmodium Torreyanum* Schindl. l. c., nomen nudum in obs.—Chiefly in dry woods and clearings, n. Fla., to e. Tex., n. to Del. and inland only to Ark. and Tenn.

DELAWARE: NEWCASTLE CO.: dry woods, Townsend, Aug. 17, 1911, *J. R. Churchill.*

MARYLAND: NO FURTHER LOCALITY: 1865, *W. M. Canby* ex hb. Boott. KENT CO.: near Chestertown, Aug. 30, 1920. *Will Wallis* (US).

DISTRICT OF COLUMBIA: in vicinis Washington, D. C., Oct. 1, 1882, *L. F. Ward.*

VIRGINIA: NO FURTHER LOCALITY: *Clayton* (hb. Gron. in BM, TYPE; G, phot.). PRINCESS ANNE CO.: dry argillaceous fields and

bushy clearings, Rosemont, Sept. 7, 1935, *Fernald & Long*, no. 4899. NORFOLK CO.: dry open thicket in clay, west of Gertie, June 18, 1935, *Fernald, Griscom & Long*, no. 4660. JAMES CITY CO.: on white oak slopes, n. e. Jones Mill Pond, Williamsburg, Sept. 18, 1920, *E. J. Grimes*, no. 3020. ISLE OF WIGHT CO.: dry woods, James River, northeast of Bartlett, Sept. 18, 1937, *Fernald & Long*, no. 7465; white sand of dry pine barrens, south of Lee's Mill, Aug. 23 & Sept. 2, 1940, *Fernald & Long*, no. 12676. HENRICO CO.: dry oak woods and clearings bordering Whiteoak Swamp, west of Elko Station, Sept. 21, 1938, *Fernald & Long*, no. 9347; dry sandy woods, Elko, Aug. 30, 1925, *Wherry & Pennell*, no. 12497 (Phila.). SOUTHAMPTON CO.: dry sand, pine barrens about 7 mi. south of Franklin, Sept. 7 & 8, 1937, *Fernald & Long*, no. 7464.

NORTH CAROLINA: DURHAM CO.: pine woodland near Durham, Oct. 10, 1938, *R. K. Godfrey*, no. 6703.

SOUTH CAROLINA: NO FURTHER LOCALITY: *M. A. Curtis* (a unifoliolate form, annotated as *D. rhombifolium* by A. M. Vail). BERKELEY CO.: extensive burned-over pineland clearing, near Santee-Cooper Diversion Dam, west of Pineville, Sept. 13, 1939, *Godfrey*, no. 8224.

FLORIDA: DUVAL CO.: (probably from Jacksonville, cf. Hooker, Comp. to Bot. Mag. i. 23 (1835)), *Drummond;* dry pine or oak lands near Jacksonville, *fl.* Aug. 6, *fr.* Sept. 15, 1894, *A. H. Curtiss*, no. 4902.

TENNESSEE: COUNTY INDEFINITE: along the French Broad River between Paint Rock and Del Rio, Sept. 1, 1897, *Kearney*, no. 653 (Mo.). MADISON CO.: rich thickets, Jackson, Sept., 1892, *S. M. Bain*, no. 304 (NY).

ALABAMA: NO FURTHER LOCALITY: *Dr. Gates* (NY).

MISSISSIPPI: HANCOCK CO.: in cemetery of Bay St. Louis, Sept. 13, 1883, *Langlois* (NY). WILKINSON CO.: Sept. 9, 1864, *D. L. Phares*, no. 1725 (US, annotated by Schindler as *Meibomia viridiflora*).

ARKANSAS: ST. FRANCIS CO.: Crowley's Ridge, Madison, ca. 65 m. alt., Sept. 3, 1940, *Demaree*, no. 21579. LINCOLN CO.: Yorktown, Bayou Bartholomew, ca. 60 m. alt., Sept. 20, 1936, *Demaree*, no. 13715A. HOWARD CO.: Baker Springs, Oct. 7 and 8, 1909, *J. H. Kellogg* (Mo, 2 sheets).

LOUISIANA: NO FURTHER LOCALITY: *M. A. Curtis* (Mo). CADDO PARISH: Shreveport, Aug. 5, 1847, *Dr. Gregg*, s. n., p. p. (Mo). CALCASIEU PARISH: Sulphur Spring, Oct., 1919, *Arsène*, no. 11343 (US, annotated by Schindler as *Meibomia viridiflora*).

TEXAS: HARRIS CO.: Houston, Sept., 1842, *Lindheimer*. BRAZOS CO.: 2–3 miles east of Koppe Bridge in deep sand in woods, Sept. 13, 1941, *R. G. Reeves*, no. 1095.

The combination *Desmodium viridiflorum* has been generally attributed in manuals and lists to Beck (1833). However, DeCandolle made the same combination in the Prodromus (1825) and, although the plant on which he based his combination was not true *H. viridiflorum* L., according to the International Rules of Botanical Nomenclature his combination must be retained.[1] Discussion of the relationship of *D. viridiflorum* and *D. Nuttallii* will follow the latter species.

D. **Nuttallii** (Schindl.), comb. nov. Herbaceous to suffrutescent; stems striate, stout, up to 1.5 m. (Indiana, *Kriebel*), erect or ascending, simple or branched from base, densely to moderately uncinulate-pubescent and somewhat spreading-pilose; leaves chiefly trifoliolate (sometimes unifoliolate at base), stipulate, petiolate; the striate lance- to ovate-acuminate ciliate stipules with truncate base essentially glabrous on inner surface and rather densely appressed-pilose on dorsal surface, not very long-persistent, 3–5.5(–6.5) mm. long; the subulate stipels ciliate and densely white-pilose on outer surface, 1.5–3.5(–4) mm. long; petioles striate, rather densely uncinulate-pubescent and sparsely to densely patent-pilose with long straight trichomes, 0.5–2.5 (–3.3) cm. long; the sulcate leaf-rachis exceeding the petiole in length in the upper leaves, 0.4–1.6(–2.3) cm. long; petiolules very densely long-pilose, 1.5–4 mm. long; terminal leaflets ovate to rhombic on upper portions of plant, mostly elliptic-ovate below, with apex acute to obtuse and base mostly rounded (rarely cuneate to truncate), 5.2–10 cm. long, 2.8–5.6 cm. wide; the elliptic to ovate lateral leaflets becoming revolute, moderately appressed pilose above and slightly uncinulate-pubescent near base, rather densely and very softly tomentulose beneath, 3.4–8 (–10) cm. long, 2.1–5.1 cm. wide; inflorescence racemose-paniculate, chiefly terminal, rachis uncinulate-pubescent and with occasional spreading pilosity; the mostly ovate-acute striate and ciliate primary bracts puberulent and pilose over dorsal surface, 2–4 mm. long; the lance-ovate secondary bracts ciliate and pilose, 0.5–1.5 mm. long; pedicels uncinulate-pubescent and very finely puberulent, (2.5–)3.5–6.5 mm. long; calyx somewhat pilose throughout but chiefly so along the central portions of the lobes, upper bifid lobe 1.5–2 mm. long, central tooth of lower lobe 2–3.5 mm. long, lateral lobes 1.5–2.5 mm. long; corolla about twice length of calyx; standard obovate, with more or less cuneate

[1] Cf. Art. 54, paragraph 2, emended in Journ. Bot. lxxiv. 76 (1936): "'When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it' ".

base, (4–)4.5–6.5 mm. long, 4–5 mm. wide; wings oblong-elliptic or falcate with rounded apex, 4–6 mm. long, 1.5–2.5 mm. wide; keel-petals falcate with truncate apex, abruptly narrowed to a claw one-third the length, (4.5–)5–7 mm. long, 1.5–2 mm. wide above; loment stipitate, 1–4-articulate; stipe 2.5–4 mm. long; articles with rounded upper suture and more or less cuneate lower suture, uncinulate-pubescent throughout, 4–7 mm. long, 3–4.5 mm. wide.—*Meibomia Nuttallii* Schindl., Rep. Spec. Nov. xxiii. 354 (1927). *Desmodium viridiflorum* of many authors, p. p. —Chiefly in dry sandy open woods, N. Y. to Ind., s. to n. Fla., Ala. and Ark.

NEW YORK: KINGS CO.: copse, Brooklyn, Sept. 1, 1842, ex hb. *John Carey*.

NEW JERSEY: CUMBERLAND CO.: dry sandy open pine and oak woods about 1 mi. w. of Hoffmans Mill, Sept. 1, 1933, *Fogg*, no. 5980.

PENNSYLVANIA: NORTHAMPTON CO.: Chestnut Hill, Easton, Sept. 5, 1894, *T. C. Porter*. DELAWARE CO.: dry field, Wayne. Sept. 10, 1910, *Bartram*, nos. 1158 and 1167.

MARYLAND: BALTIMORE CO.: railroad embankment, Bare Hills, Sept. 15 and 16, 1908, *J. R. Churchill* (G, 3 sheets).

VIRGINIA: SOUTHAMPTON CO.: dry pine woods west of Adams Grove, Sept. 14, 1937, *Fernald & Long*, no. 7469; woods, Southampton, *Pursh* (Phila; G; phot.). FAUQUIER CO.: woods near High Point, above Broad Run Station, western slope of Bull Run Mountains, Sept. 29, 1935, *Allard*, no. 1027. DINWIDDIE CO.: dry pine and oak woods south of Carson, Sept. 14, 1937, *Fernald & Long*, no. 7468. BEDFORD CO.: Sept. 1871, *A. H. Curtiss*. CRAIG CO.: Craig's, 600 m. alt., Aug. 22, 1903, *E. S. & Mrs. Steele*, no. 72 (US (490070) LECTOTYPE; G, duplicate).

NORTH CAROLINA: NASH CO.: pineland at Middlesex, Oct. 9, 1938, *Godfrey & Kerr*, no. 6667. WILSON CO.: moist humus soil, recently cleared woodland, 4 mi. se. of Wilson, July 7, 1922, *L. F. & F. R. Randolph*, no. 718. SAMPSON CO.: pineland near Rosebarn, June 11, 1938, *Godfrey*, no. 4531. STOKES CO.: Salem, *Schweinitz*, s. n., p. p. (Phila). BUNCOMBE CO.: dry, open woodlands, Biltmore, Sept. 10, 1898, *Biltmore Herb.*, no. 3788a. SWAIN CO.: woods, ca. 560 m. alt., Aug., 1891, *Beardslee & Kofoid*.

SOUTH CAROLINA: AIKEN CO.: Aiken, Sept. 24, 1866, *Ravenel* (G, Mo).

FLORIDA: ALACHUA CO.: on dry cleared scrub-oak land near Hogtown Creek and Newberry Road west of Gainesville, Oct. 17, 1945, *West & Arnold*, no. 4 (Fla).

INDIANA: BROWN CO.: in partial shade on old field, Cornus Ridge, 5.5 mi. ne. of Nashville, Sept. 18, 1941, *Friesner*, no. 16419. LAWRENCE CO.: open woods, above Gardner Kaolin Mines, 3.4 mi. sw. of Bryantsville, Sept. 12, 1934, *Kriebel*, no.

2642. POSEY CO.: in sandy soil on the high bank of Rush Creek in the Dransfield woods about 3 mi. s. of New Harmony, Sept. 22, 1934, *Deam*, no. 55697.

TENNESSEE: KNOX CO.: dry woods along Tennessee River, Knoxville, Oct. 2, 1904, *Ruth*, no. 293.

ALABAMA: LEE CO.: Auburn, *Earle & Baker*.

MISSOURI: MC DONALD CO.: dry ground, Sept. 1, 1893, *Bush*, no. 62 (C, G).

ARKANSAS: woods, nw. Arkansas, *F. L. Harvey*, no. 1. HOWARD CO.: Baker Springs, Oct. 5 and 7, 1909, *J. H. Kellogg* (Mo (1 full sheet and portions of two others)).

D. Nuttallii is very closely related to *D. viridiflorum*, but, except for the specimens annotated by Schindler in the United States National Herbarium, seems not to have been taken up, despite the fact that many students have recognized the existence of another element in the material often identified as *D. viridiflorum*. The most outstanding character by which *D. Nuttallii* may be distinguished from *D. viridiflorum* is the curved upper suture which gives the loment-articles a rounded appearance while those of *D. viridiflorum* are more nearly rhombic in outline. In general, the shape of the terminal leaflets as well as the somewhat smaller size of all its parts and its more inland range serve to separate *D. Nuttallii* from its nearest relative.

Since Schindler cited no type (nor, in fact, any specimens) when he described this species I am citing as the LECTOTYPE a specimen from Craig's, Craig County, Virginia, collected by Mr. and Mrs. E. S. Steele, no. 72 (US), which was annotated by Schindler in the course of his studies.

Desmodium rhombifolium (Ell.) DC. has been considered an integral part of our more southerly flora for a long period, in spite of the fact that its identity has not ever been completely clear. Torrey & Gray in the Flora of North America considered it identical with *D. laevigatum* and it has more recently been treated as synonymous with *D. floridanum*. Part of the difficulty has arisen through mixed collections, Elliott apparently having distributed specimens as identical, which were unlike that in his own herbarium; and part through some confusion in Elliott's own treatment. The specimen which had been labeled by Elliott as *H. rhombifolium* was photographed for the Gray Herbarium by Mrs. C. A. Weatherby and has recently, through

the kindness of the director, Dr. E. Milby Burton, been lent me for study. At the bottom of the sheet is Elliott's label with the inscription "H. rhombifolium mihi" and below it "oblongifolium Muhl." In his Flora Elliott describes as new under *Hedysarum ciliare*, a variety—*oblongifolium*, to which I think the second inscription as well as the plant may be referred. Of the identity of Muhlenberg's plant I am not certain but Elliott may well have considered it the same as his new variety. At any rate the specimen, in flower and fruit, though not in good condition, belongs definitely to our series *Pauciarticulata*, which includes also *D. ciliare*, and not to the series *Stipitata* of which *D. floridanum* and the material up to now treated as *D. rhombifolium* are members.

In view of the long period of confusion it seems best to me to place *D. rhombifolium* in the category of a *nomen confusum* and to deal separately with the material identified as that species which is, however, not related to Elliott's plant. The more southern material with persistent stipules and strongly reticulate often unifoliolate leaflets is *D. floridanum* Chapm. The other element with early-deciduous stipules and smoother trifoliolate leaves I am describing as new and calling *D. Fernaldii*.

D. FLORIDANUM Chapm. Herbaceous; the stout, lineate to somewhat ridged and grooved simple (only rarely branched at base) stem, up to 4.5 dm. high excluding inflorescence, mostly uncinate-pubescent, occasionally also with some long, straight white spreading trichomes interspersed; leaves mostly unifoliolate below, trifoliolate above, stipulate, petiolate; the lance- to narrowly ovate-attenuate truncate stipules glabrous within, ciliate, puberulent and somewhat pilose on dorsal surface, persistent, 4–10 mm. long; the linear-attenuate to lanceolate stipels finely puberulent with some scattered longer pilosity, persistent, 1.5–5.5 mm. long; the finely ridged and grooved petioles densely to moderately uncinulate-pubescent, with straight white pilosity sparse to moderate, 1.4–3.5 cm. long; leaf-rachis similar or deeply sulcate, usually with less pubescence, 0.6–2 cm. long; the stout petiolules white with spreading pilosity, uncinulate-puberulent, 1–4 mm. long; the leaflets uncinulate-puberulent and soft-pilose with scattered fine straight trichomes beneath and with the venation prominently reticulate; the rhombic to deltoid or ovate terminal leaflet cuneate to truncate or rounded at base, obtuse to acute at apex, 4–9 cm. long, 2–5.4 cm. wide; lateral leaflets mostly similar but smaller, 3–6 cm. long, 1.5–2.7 cm. wide; inflorescence

leafless, racemose-paniculate or frequently unbranched, its rachis finely ridged and grooved, uncinulate-pubescent with finer shorter hairs than on stem; the ovate-acuminate primary bracts truncate to cordate, glabrous within, ciliate, sparsely to moderately straight-pilose and very finely puberulent on the dorsal surface, 2.5–4.5 mm. long; the lanceolate to lingulate secondary bracts ciliate, puberulent and somewhat straight-pilose on dorsal surface, 1–2 mm. long; pedicels very finely uncinulate-puberulent, (4.5–)6–8 mm. long; calyx very finely uncinulate-puberulent with some long, white, straight trichomes chiefly on the teeth of both lobes; upper bifid lobe ca. 2.5 mm. long, central tooth of lower lobe 3–4 mm. long, lateral teeth 2.5–3 mm. long; corolla about twice as long as calyx; standard obovate, 6.5–7 mm. long, 5 mm. wide, wings elliptical to somewhat oblong, short-clawed, 6.5–7 mm. long, 1.5–2.5 mm. wide; keel-petals falcate, long-clawed, 7–7.5 mm. long, 2–2.5 mm. wide; loment stipitate, 3–5-articulate; stipe 1.5–4 mm. long; articles more or less deltoid, curved on dorsal suture, broadly obtuse on ventral suture, uncinulate-pubescent throughout, 6–7 mm. long, 4–5 mm. wide. —Fl. So. U. S. 102 (1860). *Meibomia floridana* (Chapm.) O. Ktze., Rev. Gen. i. 198 (1891). *Meibomia rhombifolia* sensu Vail in Bull. Torr. Bot. Cl. xix. 113 (1892) as to syn. cit. *D. floridanum*. *M. rhombifolia* sensu Schindl. in Rep. Spec. Nov. xxiii. 356 (1927) in obs. p. p.—Dry, sandy pinelands, southern South Carolina, Georgia and Florida.

SOUTH CAROLINA: BEAUFORT CO.: sandy soil, Beaufort, Sept. 5, 1904, *Biltmore Herb.*, no. 3796a (NY). JASPER CO.: sandy open space under pines, 2 miles northeast of Coosawhatchie, July 19, 1927, *Wiegand & Manning*, no. 1597.

GEORGIA: LOWNDES CO.: along the Withlocooche River, near Valdosta, June 6–12, 1895, *Small* (C).

FLORIDA: WITHOUT FURTHER LOCALITY: *G. H. Bates*, 1889 (NY); middle Florida, *Chapman*, no. 122 (NY); no data, "Herb. Chapman, Desmodium floridanum S. fl!" (US (55092), annotated by Schindler as *Meibomia rhombifolia*). DUVAL CO.: dry open sandy oak woods, Tisonia, July 27, 1927, *Wiegand & Manning*, no. 1598; dry pine barren, May 28, 1902, *Fredholm*, no. 5254; dry, fertile, pine woods near Jacksonville, Aug. 12, 1896, *A. H. Curtiss*, no. 5717A; dry pine or oak lands near Jacksonville, *fl.* Aug. 6, *fr.* Sept. 15, 1894, *A. H. Curtiss*, no. 4902 (G; NY; US, p. p.). ORANGE CO.: Killarney, Aug., 1889, *O. Vesterlund*, no. 26 (US, annotated by Schindler as *Meibomia rhombifolia*). BREVARD CO.: scrub oak land, Okeechobee region, Apr. 6, 1903, *Fredholm*, no. 5765; dry pine lands, Eau Gallie, July 22, 1896, *A. H. Curtiss*, no. 5717 (G; NY). DADE CO.: in pinelands, Ft. Lauderdale, Nov. 19 and 25, 1903, *Small & Carter*, no. 1165 (NY); pinelands south of Miami River, Nov. 26–Dec. 20, 1913, *J. K. & G. K.*

Small, no. 4747 (NY). LAKE CO.: high pineland in vicinity of Eustis, May 1–15, 1894, *G. V. Nash*, no. 698 (NY). LEE CO.: along ditches, Myers, July–Aug., 1900, *A. S. Hitchcock*, no. 67. PASCO CO.: in dry pinelands, Lake Jovita, May 15, 1927, *H. O'Neill* (Mo). HILLSBORO CO.: Tampa, Aug., 1898, *A. M. Ferguson* (Mo). FRANKLIN CO.: Apalachicola, ex hb. "Flora of the Southern United States, and Supplement, A. W. Chapman, M.D." (US (943841), LECTOTYPE; G, duplicate).

Although Schindler, in his treatment, said that without fruit it was difficult to distinguish *D. viridiflorum*, *D. Nuttallii* and *D. rhombifolium* (including *D. floridanum*), the following characters, in addition to strong differences in habit and shape and pubescence of leaflets, will serve to separate *D. floridanum* from *D. viridiflorum:*

	D. FLORIDANUM	D. VIRIDIFLORUM
BRACTS	Only sparsely to moderately pilose on outer surface.	Abundantly pilose on outer surface at least when young.
PEDICELS	Finely uncinulate-puberulent.	Uncinulate-puberulent and abundantly pilose.
CALYX	Puberulent with only moderate pilosity on lobes.	Abundantly long-pilose throughout.

AS LECTOTYPE of *Desmodium floridanum* I have chosen a specimen from Apalachicola, Florida which bears a label indicating that it was part of the collection used by Chapman in the preparation of his Flora. As noted earlier, *Desmodium floridanum* has been placed in the synonymy of *D. rhombifolium* by authors generally. It seems, however, to be a perfectly distinct species. The particular characters which separate it from *D. Fernaldii* (*D. rhombifolium* of authors generally) will be discussed under that species.

D. **Fernaldii** sp. nov., herbacea robusta; caule ad 1.3 m. alto de radice tenui ramosoque 4 dm. longo; caule ramisque teretis vel paullum angulatis, subtiliter puberulentibus et sparse vel dense uncinulato-pubescentibus; foliolis moderate uncinulato-pubescentibus et breviter pilosis, subtus pallidioribus et uncinulato-pubescentibus in nervo medio et venis, superficie plus minusve glabra, apice obtuso vel acuto, basi cuneato vel rotundato, (4.5–)6–8(–9.3) cm. longis, 2.5–5 cm. latis; foliolis lateralibus ellipticis vel ovato-ellipticis, saepe in apice acutis et in basi truncatis, 4–6 cm. longis et 1.8–3.5 cm. latis; stipulis lanceolato-attenuatis, striatis, pilosis, mox deciduis, 2–4 mm. longis; stipite lomenti 2.5–4 mm. longo; lomento 1–5-articulato, articulis uncinulato-pubescentibus omnino, plus minusve deltoideis,

suturo superiori leviter anguloso, inferiori obtuso, 5.5–8 mm. longo, 3.3–5 mm. lato.—*Desmodium rhombifolium* sensu auth. generally, not Ell. *Meibomia rhombifolia* sensu Vail in Bull. Torr. Bot. Cl. xix. 113 (1892) excl. syn. cit. *D. floridanum* Chapm. *D. laevigatum* sensu Torr. & Gray, Fl. N. Am. Suppl. to vol. i. 695 (1840), not Nutt.—Sandy woods, se. Va. to S. C., La., and Newton Co., Tex.

VIRGINIA: NO FURTHER LOCALITY: *Rugel* (G, annotated by Gray as *D. laevigatum β. rhombifolium*). NORFOLK CO.: Northwest, Sept. 6, 1893, *A. A. Heller*, no. 1348. NANSEMOND CO.: dry sandy pine woods near Baines Hill School southwest of Cypress Chapel, Sept. 17, 1937, *Fernald & Long*, no. 7470; dry white sand of pine-barrens, east of Cox Landing, south of South Quay, Aug. 27, 1939, *Fernald & Long*, no. 11055 (G, TYPE); rich sandy oak and hickory woods above Nansemond River, east of Cahoon Pond, northwest of Suffolk, Sept. 12, 1941, *Fernald & Long*, no. 13626. ISLE OF WIGHT CO.: sandy pine and oak woods south of Zuni, Aug. 24, 1936, *Fernald & Long*, no. 6613. KING WILLIAM CO.: sandy oak woods southwest of Aylett, July 31, 1941, *Fernald & Long*, no. 13361. SOUTHAMPTON CO.: dry sandy open pine and oak woods 6 to 7 miles south of Franklin, July 19, 1938, *Fernald & Long*, no. 8728; border of dry sandy woods, Mars Hill Church, Aug. 21, 1938, *Fernald & Long*, no. 9067.

SOUTH CAROLINA: BERKELEY CO.: dry soils, Santee Canal, Sept., *H. W. Ravenel* (G, a unifoliolate form).

FLORIDA: WITHOUT FURTHER LOCALITY: *Chapman*, no. 188 (NY). ALACHUA CO.: dry knoll under *Quercus falcata* at Planera Hammock, Gainesville, Sept. 27, 1945, *West & Arnold* (Fla).

LOUISIANA: WITHOUT FURTHER LOCALITY: *Hale* (G, annotated as *D. laevigatum β. rhombifolium* by Gray; NY).

I am happy to name this species, abundant in southeastern Virginia, for Professor Merritt Lyndon Fernald whose intensive work on the flora of that state has clarified many floristic problems of long standing.

The distinguishing characters between *D. floridanum* and *D. Fernaldii* are here summarized:

	D. FLORIDANUM	D. FERNALDII
INFLORESCENCE	Little or not at all branched, naked.	Much branched.
LEAFLETS	Under surface mostly soft-pilose between lateral veins.	Under surface essentially glabrous between chief lateral veins.
STIPULES AND STIPELS	Long-persistent.	Early deciduous.
ARTICLES OF THE LOMENT	Curved on upper suture.	Mostly angled on upper suture.

D. LAEVIGATUM (Nutt.) DC. Suffruticose; the mostly terete stem lineate, (glabrous to) finely and minutely puberulent; leaves trifoliolate, stipulate, petiolate; stipules apparently very early-deciduous, only scars seen; stipels linear-lanceolate, puberulent on both surfaces, 1–3 mm. long; the glabrous to uncinulate-puberulent petioles angular or sulcate on adaxial surface, 1.8–6.6 cm. long; rachis similar, 1.1–2.8 cm. long; petiolules usually rugose, (glabrescent to) densely uncinulate-puberulent, 2.5–3 mm. long; the ovate-acute to more or less acuminate terminal leaflets mucronulate, rounded to acute at base, 4.3–8.4 cm. long, 2.8–5.2 cm. wide; the elliptic-oblong or -ovate lateral leaflets obtuse at apex, truncate or rounded at base, 3.2–7.4 cm. long, 2.5–4 cm. wide; upper surface of leaflets glabrous to sparsely puberulent, venation distinct because lighter in color than leaf-tissue, lower surface glabrous to sparsely puberulent or short-pilose, mostly on the midrib and chief lateral veins, margins becoming revolute, somewhat ciliate at base; inflorescence axillary and terminal, its rachis terete to angled, finely lineate, uncinulate-puberulent; primary bracts ovate-acuminate, striate, puberulent on both surfaces, 3–3.5 mm. long; secondary bracts slenderly ovate-acuminate, puberulent, ciliate, 1–2 mm. long; pedicels slender, lax, uncinulate-puberulent, 10–19 mm. long; calyx puberulent throughout, appressed pilose on the lobes and with finely ciliate teeth, the central tooth of lower lobe 3.5–4.5 mm. long, lateral teeth 2.5–3.5 mm. long, the upper bifid lobe 2.5–3.5 mm. long; corolla about twice as long as calyx; standard obovate, retuse to entire, cuneate at base, 7–9.5 mm. long, 4.5–7 mm. wide; wings semielliptic to oblong, short-unguiculate, somewhat to scarcely auriculate, 6.5–10 mm. long, 2–3.5 mm. wide; keel-petals more or less falcate, narrowed to a slender claw, apex truncate, 7.5–9 mm. long, 2–3 mm. wide; loment stipitate, 2–5-articulate; stipe mostly glabrous, 6–6.5 mm. long; articles more or less rhomboidal, reticulate, uncinulate-puberulent, 5–7 mm. long, 3.5–4 mm. wide.—Prod. ii. 329 (1825). *Hedysarum laevigatum* Nutt., Gen. ii. 109 (1818). *Meibomia laevigata* (Nutt.) O. Ktze., Rev. Gen. i. 198 (1891). *D. rhombifolium* (Ell.) DC., var. β. Torr. & Gray, Fl. N. Am. i. 361 (1840). *D. laevigatum* (Nutt.) DC., var. β. *monophyllum* Wood, Cl.-Bk. Bot. 308 (1861). *Meibomia laevigata* (Nutt.) O. Ktze., var. *monophylla* (Wood) Vail in Bull. Torr. Bot. Cl. xix. 112 (1892) in synon. The combination actually made by Vail is incorrectly attributed by her to Wood (who described the variety under Desmodium) and the reference given to Wood's place of publication (Bot. & Fl. 1870) is not the earliest one.—Dry sandy woods and clearings, N. Y. to Ind. and Mo., s. to n. Fla., Tenn., La. and e. Tex.

NEW YORK: SUFFOLK CO.: Manorville, L. I., Sept. 5, 1878, *H. W. Young* (US); Manor[ville?], Aug. 26, 1872, *E. S. Miller*.

NEW JERSEY: NO FURTHER LOCALITY: *Nuttall* (Phila, ISOTYPE; G, photo). ATLANTIC CO.: sandy clearing in pine barren woods, Hammonton, Sept. 4, 1917, *A. Gershoy*, no. 362. GLOUCESTER CO.: Swedesboro, Aug. 20, 1895, *C. D. Lippincott*, s. n.

PENNSYLVANIA: NORTHAMPTON CO.: Chestnut Hill, Easton, Sept. 5, 1894, *T. C. Porter*. PHILADELPHIA CO.: woods, East Fairmount Park, Philadelphia, Sept. 24, 1875, *Redfield*, no. 4246 (Mo). BERKS CO.: unused trolley line ½ mile sw. Klapperthal, ca. 100 m. alt., Oct. 4, 1940, *Berkheimer*, no. 2358.

MARYLAND: WICOMICO CO.: common in *Pinus Taeda* forests near Salisbury, Sept. 20, 1914, *Tidestrom*, no. 7438; Salisbury, July, 1887, ex hb. *Canby*. BALTIMORE CO.: sandy soil in clearing, Sept. 17, 1908, *J. R. Churchill*.

VIRGINIA: NORTHAMPTON CO.: dry pine woods east of Eastville, Oct. 12, 1935, *Fernald & Long*, no. 5325. PRINCESS ANNE CO.: dry pine woods, Macon's Corner, Sept. 21, 1933, *Fernald & Long*, no. 2829 and Sept. 8, 1935, no. 4898. NANSEMOND CO.: dry white sand of pine barrens, east of Cox Landing, south of South Quay, Aug. 27, 1939, *Fernald & Long*, no. 11056. SUSSEX CO.: dry white sand of woods and clearings near Chub, Sept. 20, 1940, *Fernald & Long*, no. 12677. GREENSVILLE CO.: low clearing along Quarrel's Creek, below Pair's Store, Sept. 14, 1944, *Fernald* (*& J. B. Lewis*), no. 14714. FAUQUIER CO.: woods near High Point north of Beverly, western slope of Bull Run Mountains, Sept. 29, 1935, *Allard*, no. 981. BEDFORD CO.: Sept., 1871, *A. H. Curtiss*.

NORTH CAROLINA: MOORE CO.: piney woods, Pinehurst, Aug. 21, 1897, *O. Katzenstein*. BUNCOMBE CO.: dry woodlands, Biltmore, Sept. 10, 1898, *Biltmore Herb.*, no. 1170a (G; Mo).

SOUTH CAROLINA: GEORGETOWN CO.: pine-barren clearing, 5 miles south of Georgetown, Sept. 9, 1939, *Godfrey*, no. 8120.

GEORGIA: CLARKE CO.: dry woods, Athens, 210 m. alt., June 20, 1900, *R. M. Harper*, no. 12. JASPER CO.: Monticello, Jasperly, 1848, *T. C. Porter*.

FLORIDA: DUVAL CO.: Jacksonville, 1833, *Drummond*. ALACHUA CO.: dry knoll under *Quercus falcata* at Planera Hammock, Gainesville, Oct. 7, 1945, *Arnold* (Fla); on dry cleared scrub-oak land near Hogtown Creek and Newberry Road, west of Gainesville, Oct. 17, 1945, *West & Arnold*, no. 1 (Fla).

INDIANA: BROWN CO.: old hilltop field, Cornus Ridge 5.5 mi. ne. Nashville, Sept. 11, 1941, *Friesner*, no. 16353. LAWRENCE CO.: open black-white oak ridge, 2 miles sw. Bryantsville, Aug. 16, 1934, *R. M. Kriebel*, no. 2643.

TENNESSEE: rocky woods, Chilhowee Mts., ca. 660 m. alt., Sept., *A. H. Curtiss*, no. 620. DAVIDSON CO.: vicinity of Nashville, *Gattinger*.

MISSOURI: REYNOLDS CO.: head of ravine above Kelley (Cook) Spring, 2 mi. south of Oates, between West Fork and Centerville, Sept. 22, 1935, *Steyermark*, no. 19770 (Mo).

ARKANSAS: DREW CO.: ridge woods, Monticello, 80 m. alt., Sept. 12, 1937, *Demaree*, no. 16220 (G, this collection should be checked in other herbaria, there seems to be a mixture). BRADLEY CO.: low wooded ridges, Jersey, ca. 33 m. alt., Sept. 18, 1938, *Demaree*, no. 18333. GARLAND CO.: low rocky hills above proposed dam across Ouachita River, Cedar Glades, ca. 140 m. alt., Aug. 28, 1939, *Demaree*, no. 20454. POLK CO.: low rocky hills, Shady Lake, Shady, 400 m. alt., Aug. 12, 1937, *Demaree*, no. 15697, p. p.

LOUISIANA: NO FURTHER LOCALITY: *Hale*.

TEXAS: NO FURTHER LOCALITY: *Wright*. HARRIS CO.: Houston, Aug., 184–, *Lindheimer*. DALLAS CO.: sandy woods, rare, Sept., 1874, *Reverchon*.

In their Flora of North America (p. 361) Torrey & Gray quote Nuttall's description of *D. laevigatum* in its entirety and state that they have not seen specimens. In the Supplement (p. 695) however, the authors say:

> 10. D. laevigatum (Nutt.) proves, from the examination of an original specimen, to be the same with D. rhombifolium. Our notice of D. laevigatum should therefore be erased and the name adopted in place of D. rhombifolium.

There is in the Gray Herbarium a specimen (Louisiana, *Hale*) annotated by Dr. Gray: "D. rhombifolium β. Fl. p. 361 D. laevigatum, *suppl.*"; this specimen is good *D. laevigatum*, a little larger in all its parts than the isotypic material of Nuttall's species which is at hand, but otherwise perfectly comparable. Elliott's type of *H. rhombifolium* is, on the other hand, not at all identifiable with *D. laevigatum*.

C. THE DESMODIUM PANICULATUM COMPLEX

In most recent treatments there has been no question at all concerning the identity of *D. paniculatum*. The two varieties of it described by Torrey & Gray have either been applied to the extremes or ignored. An earlier variety described by Desvaux (under *Hedysarum paniculatum*) and transferred to *Meibomia paniculata* by Schindler, included (in his sense) a large portion of the material previously treated as *D. Dillenii* as well as *D.*

glabellum. I shall consider first *D. paniculatum* and then the other members of the group.

Desmodium paniculatum (L.) DC. Prod. ii. 329 (1825), var. **typicum.** *Hedysarum paniculatum* L. Sp. Pl. 749 (1753). *Meibomia paniculata* (L.) Ktze. Rev. Gen. 198 (1891). *D. paniculatum*, [var.] β. *angustifolium* Torr. & Gray, Fl. N. Am. 364 (1840). *M. paniculata*, var. *angustifolia* (Torr. & Gray) Vail, Bull. Torr. Bot. Cl., xix. 112 (1892). *M. angustifolia* (Torr. & Gray) Kearney, Bull. Torr. Bot. Cl., xx. 481 (1893), not (HBK.) Ktze. *M. paniculata*, var. *Chapmani* Britton, Mem. Torr. Bot. Cl. v. 204 (1894).

Linnaeus's *Hedysarum paniculatum* was based on a Clayton plant in the Gronovian Herbarium (British Museum, Nat. Hist.). From the photograph in the Gray Herbarium it is clear that the leaflets are of the narrower type (at least on upper portions of the plant), a terminal leaflet being only 7 mm. broad at base. In other characters there is no difference between the broad- and narrow-leaved plants. There is, on the other hand, such complete gradation from one extreme to the other that they are best kept together as the somewhat polymorphic var. *typicum*.

Torrey & Gray's variety "β. angustifolium: leaves all narrower" from "Southern and Western States!" has no more validity, so far as I can see, than their var. *pubens* discussed below. It is typical *D. paniculatum*.

There are a few other individual specimens which differ in loment-characters from typical *D. paniculatum*, but lack of sufficient material or adequate information about the material at hand makes me hesitate to treat them as an entity of real taxonomic significance.

In the hope, however, that collectors will watch for such peculiar specimens I cite here the most outstanding. Two specimens with elliptic to only obtusely angled loment-articles and very broad isthmi: Indiana: knox co.: sandy soil along railroad, ½ mi. south Oaktown, Sept. 11, 1934, *Friesner*, no. 7922. Nebraska: thurston co.: Missouri River bottoms, Winnebago Indian Reservation, Aug. 9, 1941, *W. B. Fox*, s. n.

Two specimens with fruit approaching that of *D. ciliare*, but with habit- and pubescence-characters of one of the phases of *D. paniculatum:* Rhode Island: providence co.: Providence, *S. T. Olney*. Tennessee: cocke co.: within three miles of Wolf Creek Station, Aug. 31, 1937, *Kearney*, no. 659 (US).

Var. **epetiolatum,** var. nov. A var. *typica* differt foliis sessilibus vel brevipetiolatis; articulis lomentorum rotundatis.—*D. paniculatum*, var. *pubens* sensu most authors.—Sphagnous bogs, damp clearings and sandy pine- and oak-woods, Coastal Plain of se. Va. and e. N. C.; Colorado Co., Tex.

VIRGINIA: ISLE OF WIGHT CO.: sandy pine- and oak-woods south of Zuni, Aug. 24, 1936, *Fernald & Long*, no. 6615. NANSEMOND CO.: dry sandy pine-woods near Baines Hill School, southwest of Cypress Chapel, Sept. 17, 1937, *Fernald & Long*, no. 7471 (G, TYPE); white sand of pine- and oak-woods and clearings near Cathole Landing, west of Factory Hill, Aug. 23, 1940, *Fernald & Long*, no. 12678½. NORFOLK CO.: Northwest, Sept. 6, 1893, *A. A. Heller*, no. 1255; damp old clearings and thickets, eastern side of Great Dismal Swamp, north of Wallaceton, Sept. 4, 1941, *Fernald & Long*, nos. 13630 and 13631. PRINCESS ANNE CO.: open sands back of dunes, Rifle Range, south of Rudy Inlet, Sept. 6, 1935, *Fernald & Long*, no. 4901. GREENSVILLE CO.: sphagnous bog about 1 mile northwest of Dahlia, Aug. 20, 1938, *Fernald & Long*, no. 9072.

NORTH CAROLINA: BEAUFORT CO.: pineland near Chocominty, July 20, 1938, *Godfrey*, no. 5408. COLUMBUS CO.: pine-woodland near Nokina, Aug. 29, 1938, *Godfrey*, no. 6354. ROBESON CO.: dry open sand-barrens, 14 miles southeast of Lumberton, July 4, 1927, *Wiegand & Manning*, no. 1591.

TEXAS: COLORADO CO.: 1 mile east of Weimar, Oct. 4, 1937, *Cory*, no. 25086.

Most of the material here designated as the new var. *epetiolatum* had previously been named, with more or less doubt, var. *pubens* Gray. Var. *pubens*, however, does not seem to me to be a tenable variety. Gray described it in the following manner:

> "γ. pubens: stem puberulent; leaves oblong-lanceolate, rather rigid, pubescent, especially beneath."

with the citation:

> "γ. Tampa Bay, Florida, *Dr. Burrows!*
> Western Louisiana, *Dr. Hale!*

The two cited specimens are before me and they are not the plants with short-petiolate leaves and more or less broadly obtuse leaflets which have been quite generally called var. *pubens*, but rather the more pubescent extreme of *D. paniculatum*, var. *typicum* which is scarcely worthy of a name. The specimens which Gray cited are not whole plants, simply the uppermost

portion of stem with inflorescence. This accounts for the somewhat shorter petioles but these are no shorter than those similarly placed in plants of var. *typicum*.

Another group of plants which has been called var. *pubens* has the general aspect and superficial characters of var. *epetiolatum*, but with angular loment-articles as in var. *typicum*. It forms, in general, a group of somewhat more inland range than var. *epetiolatum*, but at present does not seem to constitute a unit sufficiently distinct morphologically or geographically from the typical state to be specially designated. Further field-studies may bring to light critical characters which will warrant segregation of these plants.

Desmodium Dillenii Darlington has been perhaps the least clearly understood species of the genus in our flora. It was based by Darlington on a series of specimens representing two different elements, both of which were incorporated by him in his description. Two of the specimens from Darlington's herbarium have short petioles (to 3.3 cm.) and obtuse leaflets, two others have long petioles (up to 7 cm.) and leaflets nearly acute. The Dillenian plate to which Darlington refers is a very crude drawing which could not with certainty be referred to any of our species, the only significant character which may be observed in it being short-petiolate leaves. In view of Darlington's own confusion and the perplexity of botanists ever since concerning his species I propose to reduce the name (as I have *D. rhombifolium*) to the status of *nomen confusum* and divide the composite into its distinct elements. The first of these, that with obtuse leaflets and shorter petioles, is *D. glabellum* (Michx.) DC., while the second, with acute leaflets and long petioles I am calling *D. perplexum* sp. nov.

Schindler reduced *D. glabellum* to *Meibomia paniculata*, var. *obtusa* (Desv.) Schindl. but *D. glabellum* seems to me too well defined for that disposition. In addition to the characters already mentioned the usually retuse leaflets with prominently reticulate venation are very characteristic. *D. perplexum*, on the other hand, has thinner leaflets usually more abundantly pilose and with little or only obscure reticulation.

D. **perplexum** sp. nov., herbacea; caule tenui vel robusto, uncinulato-puberulenti, fere piloso, 6 dm. longo de radice crasso

1 dm. longo; stipulis tenuis longo-attenuatis, persistentibus; petiolis et rhachibus foliorum pilosis; foliolis elliptico-ovatis vel ovatis praecipue acutis, undique pilosis; rhachibus inflorescentiae uncinulato-puberulentibus et moderate pilosis; pedicellis 1 cm. vel minus longis; lomentis stipitatis, 2–5-articulatis; articulis plus minusve rhomboideis, uncinulato-puberulentibus.—*D. Dillenii* Ell. in part (excl. plants with obtuse reticulate leaflets).—Sandy woods, centr. Me. to Wisc. and s. rather generally throughout our range and beyond.

Because of its wide distribution and the enormous number of collections in all herbaria I shall not now, except for the type, cite specimens of *D. perplexum*. This will be done, however, in the monographic treatment, where a map of the distribution of the species will also be presented.

TYPE: VIRGINIA: SUSSEX CO.: thicket bordering Bryant Pond, about ½ mile ne. of Waverly, Sept. 13, 1945, *Fernald & Long*, no. 14937 (G).

D. HUMIFUSUM (Muhl.) Beck, the remaining member of this group has not been much recognized since its description. Specimens of it have at various times been identified as *D. ochroleucum*, *D. glabellum* and various other species. It is a spreading (though stiff) plant with often broad, abruptly attenuate stipules and broad leaflets. Its leaflets are much thinner, less coriaceous and usually narrower, however, than those of *D. ochroleucum*, its flowers very much smaller, pedicels shorter and its loments with more numerous, smaller articles uncinulate-puberulent throughout (rather than glabrous except on sutures) and with margins not folded. From *D. glabellum* *D. humifusum* differs in its prostrate habit, thinner leaflets and broader and longer persistent stipules among other characters. Its distribution is much more local than that of *D. glabellum*.

SIDELIGHTS FROM ZOOLOGY ON BOTANICAL NOMENCLATURE[1]

LLOYD H. SHINNERS

IN a recent article ("Official Plant Names?" in RHODORA **52:** 1–7, 1950), Dr. F. R. Fosberg has discussed some of the implications in efforts to add a list of conserved names of species to the rules of botanical nomenclature. His discussion is in accord with an earlier one by Dr. Albert C. Smith ("A Legislated Nomenclature for Species of Plants?" in Amer. Journ. Bot. **36:** 624–626, 1949). Dr. Fosberg remarks, "One of the most inevitable evils that would arise under such a scheme would be an attempt to substitute decision by authority for taxonomic research. . . . Under even the best-informed authority this would be an intolerable infringement of freedom of research." He adds further, "In repeated conversations with non-taxonomic users of botanical names it has become very evident that the annoyance with name changes is an indiscriminate one. . . . There is sometimes resentment even of cases resulting from increased taxonomic knowledge. . . . There are matters that cannot be settled by legislation any more than the principles of genetics can be regulated by the decisions of political commissars."

Systematic botanists are generally unaware of how far their zoological brethern have gone toward the acceptance of authoritative (in the sense of dictatorial, not of specially competent) and arbitrary decisions by a handful of individuals. It may seem strange to botanists that an 18-man Commission (the number now to be increased) is empowered to abrogate ("suspend") the zoological rules altogether at any time for any specific item, to exclude certain publications from consideration, or to designate types of genera and higher groups without simultaneous taxonomic study. Those who have a nodding acquaintance with such small and taxonomically rather simple groups as the birds or mammals are likely to have an illusory impression that systematic zoology is stabilized and orderly, in very favorable contrast with the condition of systematic botany, and are apt to attribute this to the rules of nomenclature rather than to the

[1] Space subsidized by the author to insure immediate publication.

subject matter. It is worth citing an example from the invertebrates, in which complications equal to any in botany have arisen, and have been aggravated by an authoritative ruling. V. S. L. Pate, in "The Generic Names of the Sphecoid Wasps and Their Type Species (Hymenoptera: Aculeata)" (Memoirs of the American Entomological Society No. 9, 1937), has the following discussion of the typification of *Sphex* Linnaeus (l. c., pp. 83–85):

"As type of the Linnaean genus *Sphex*, Latreille in 1810 proposed *Sphex flavipennis* Fabricius, 1793, a species not described until five years after Linnaeus' death. Nevertheless, in spite of this, the name *Sphex* was used almost uniformly in the sense of Latreille for nearly a hundred years until [Henry Torsey] Fernald in 1905 called attention to this error, discussed it at some length, [and] designated *Sphex sabulosa* Linnaeus, 1758 as type of *Sphex* Linnaeus, 1758, a decision with which the International Commission on Zoological Nomenclature concurred in rendering Opinion 32. . . . *Sphex* Linnaeus, 1758 thereby became isogenotypic with *Ammophila* Kirby, 1798, which fell as an absolute synonym and *Chlorion* Latreille, 1802, as the next oldest name in the group, was resurrected to be used for *Sphex* Auctt. *nec* Linnaeus. Recently the Commission while still of the opinion that *Sphex sabulosa* Linnaeus is the type of *Sphex* Linnaeus, 1758, but likewise, as a result of representations brought before them, presumably convinced that strict application of the rules in this case might apparently cause greater confusion than uniformity, proposed to suspend the rules and recognize as valid Latreille's designation of *Sphex flavipennis* Fabricius, 1793 as the type of *Sphex* Linnaeus, 1758. If this course is followed, the name *Sphex* reverts to the group . . . which has laterly been known as *Ammobia* Bilberg, 1820. *Ammophila* Kirby, 1798, is then resurrected for *Sphex* in the sense of Linnaeus and Fernald. However, as an immediate corollary of this proposed action, *Sphex*, as the Commission now advocates that it should be used, must be accredited to Latreille, presumably 1810, for only by the most specious sophistry may the name still continue to be attributed to Linnaeus. Moreover, *Sphex* Latreille *nec* Linnaeus, 1758, is a homonym, no matter how the case is reviewed, and as such, is invalid. Its validity is entirely dependent upon the dubious authority of a commission whose personnel must inevitably change from time to time. There is no guarantee that future commissions will not abrogate the proposed decision as readily as the present body now proposes in effect to annul that of its predecessor. It is needless to point out further the absurdity of following the procedure which the commission now proposes to advocate, that by this action they tend to vitiate such powers as they have, that in effect they nullify all preceding opinions and tend to destroy the foundations upon which the Zoological Code is founded. Their abject capitulation to the plea of temporal expediency in this instance is most certainly ill advised. Four or five decades ago the vertebrate zoologist underwent the same nomenclatorial travail that the entomologist is now undergoing. The mammalogist, the ornithologist, and the remaining vertebrate confraternity have apparently survived this period of labour. The entomologist, however, is fast approaching that condition which will soon permit him to be classed as one of those animals which are his chief concern."

Surprising though it may seem to many, botanists have grounds for pride in the history of the development of their rules of nomenclature, which have been more extensively worked out and more universally accepted for a longer time than those of the zoologists. Not until 1905 were the zoologists able to publish an international set of tules of nomenclature, and the present Code, which must serve the vast fields of entomology and protozoology as well as vertebrate zoology, amounts to only 35 articles. Contrast this with the botanical rules, whose adoption in 1905 in more or less their present form had been preceded by nearly forty years of publication and wide acceptance of two major sets of rules, and which at present include 74 articles, together with numerous recommendations, examples, and appendixes. The interested reader is referred to "A Discussion on the Differences in Observance Between Zoological and Botanical Nomenclature. 2. The Case for the Zoologists," by Francis Hemming (Secretary of the International Zoological Commission), Proc. Linn. Soc. London **156:** 134–137, 1944. The zoological Code is reprinted in "Procedure in Taxonomy," by Edward T. Schenk and John H. McMasters, revised edition, published in 1948 by Stanford University Press. (This book deals only with systematic zoology, primarily the field of paleontology, and not with the broad subject of taxonomy as the title implies.)

Botanists have perhaps some grounds for comfort in knowing that the zoological rules are now in process of more drastic revision than the botanical ones have seen in more than a third of a century. (See "Important Advances in Zoological Nomenclature Achieved at 13th International Congress of Zoology," by Francis Hemming, Science n. s. **108:** 156–157, Aug. 13, 1948.)

Botanists may be surprised by certain of the autocratic requirements in the zoological code regarding orthography. Article 3 states, "The scientific names of animals must be words which are either Latin or Latinized, or considered and treated as such in case they are not of classic origin." Nevertheless, Article 20 states, "In forming names derived from languages in which the Latin alphabet is used, the exact original spelling, including diacritic marks, is to be retained. Examples: . . . *möbiusi*, . . . *čžjžeki*, . . . *färöensis*." In partial contradiction, a recommendation under this same article reads, "In proposing

new names based upon personal names which are written sometimes with ä, ö, or ü, at other times with ae, oe, and ue, it is recommended that authors adopt ae, oe, and ue." A lengthy Appendix F to the Code "indicates the manner in which Greek words should be transliterated." But this legislative gesture of acquiescence in good scholarship is counteracted by Article 14c, paragraph 3: "If the name is a modern patronymic, the genitive is always formed by adding, to the exact and complete name, an *i* if the person is a man, or an *ae* if the person is a woman, even if the name has a Latin form. . . . Examples: . . . *möbiusi*, . . . *bosi* (not *bovis*), *salmoni* (not *salmonis*)." To a botanist with even a smattering of Latin, it would appear that zoologists are compelled to illiteracy by legislative fiat—and by quite inconsistent regulations at that.

Botanists may find it strange also that names of subgenera are treated as of equal value (and are frequently used interchangeably) with those of genera, and of subspecies with those of species—going beyond a peculiarity of the American Code long since abandoned by botanists. Up to the present, there has been no provision in the zoological rules for names of groups below the rank of subspecies—a fact often overlooked by botanists who desire to substitute the term subspecies for variety in botanical nomenclature. (Provision for subspecific groups is to be added to the next edition of the zoological rules.) Those who believe that zoologists never capitalize specific names may be surprised by Article 13: "While specific substantive names derived from names of persons may be written with a capital initial letter, all other specific names are to be written with a small initial letter. Examples: *Rhizostoma Cuvieri* or *Rh. cuvieri*, *Francolinus Lucani* or *F. lucani*."

I hope that the above example and quotations will suggest to botanists the unwisdom of pinning hopes for progress upon dictatorial regulations, or of attempting to modify the botanical rules after the model of the zoological ones, without understanding the history of and present practice under the latter. The zoologists long ago adopted an official list of generic names, to which names of species are now to be added. The present state of systematic entomology is far behind that of systematic botany, as might be expected from the enormously large number of species

of insects, and the relatively small number of monographers working on them. The troubles which led to Pate's angry protests, quoted above, are very possibly a forerunner of many more likely to confront the entomologists because of the Official List and other features of the zoological rules. Surely there is much food for thought in Dr. Fosberg's remark that in the botanical rules the principle of priority and the type method "are the only fundamentally objective features in the rules of nomenclature, and are the bulwarks standing between an orderly and understandable system and nomenclatural anarchy." Botanists will do well to drop their legendary inferiority complex (wholly unjustified by their accomplishments in systematics), and follow closely the spirit of Article 6 of their rules (quoted almost word for word in Article 1 of the zoological code): "Botanical nomenclature is independent of zoological nomenclature." The zoologists have adopted arbitrary rules, then permitted a group of individuals to suspend them as occasion arises. The results have not been altogether happy. Botanists may well heed Dr. Smith's admonitions against what is likely to be "an impractical solution of a problem which is approaching clarification by the normal procedures of careful monographic and bibliographic work in plant taxonomy."

SOUTHERN METHODIST UNIVERSITY
Dallas 5, Texas

RANGE-EXTENSIONS AND -CLARIFICATIONS IN NEW HAMPSHIRE

A. R. HODGDON AND STANLEY KROCHMAL

IT seems advisable to record range data for a miscellaneous assemblage of New Hampshire species of vascular plants collected by the authors or brought to their attention during recent years.

1. RANUNCULUS FASCICULARIS Muhl.

On May 15, 1948, the senior author and K. W. Woodward collected this buttercup near the summit of the middle member of the Pawtuckaway Mountains in the township of Nottingham. The habitat was a warm southern slope dominated by *Carya ovata* and *Ostrya virginiana*—the elevation somewhat more than

700 feet. The species has been reported previously from New Hampshire but specimens of it are difficult to locate. F. W. Batchelder[1] listed it with the accompanying notation "rare" and H. G. Jesup[2] reported it from "North Charlestown—Dr. Graves". The Reverend H. J. Sheehan O.S.B. of St. Anselm's College who has made an exhaustive study of the Batchelder Herbarium reports that he has failed to find there a specimen of *Ranunculus fascicularis*. However, the earlier collections of Batchelder were destroyed by fire in 1902 and apparently he did not succeed in replacing all of these before his death in 1911. As the species has not been reported from Maine[3] or farther to the Northeast[4], the new station would seem to have particular significance as a northeastern extension of range.

2. Chimaphila maculata (L.) Pursh.

On October 20, 1948, a class in Botany from the University of New Hampshire, while exploring a deciduously wooded southern slope in Lee, near Turtle Pond, found a few scattered plants of the attractive spotted wintergreen. The member of the group to have first noticed its variegated foliage among the fallen hickory leaves was Mr. Francis Fay.

In the second edition of Jesup's Flora, 1891, there appears the following note relating to *C. maculata* "growing with *C. umbellata.*" This may refer to Vermont for which there are several accepted printed records. A more definite N. H. report is that of Walter Deane[5] who states that an herbarium specimen had been seen from New Hampshire. On August 31, 1929, the Reverend H. J. Sheehan collected *Chimaphila maculata* in a pine-grove in Goffstown, Hillsboro Co., along the Piscataquog River. In 1948 this station was revisited but camps had been erected and according to Sheehan's report "the search was fruitless". Recently the senior author located a specimen of *C. maculata* in the Windham collection of Wm. Samuel Harris. It is possible

[1] Plants of Manchester, N. H. Proc. Manchester Institute of Arts and Sciences, Vol. IV, Part 2, 1909.

[2] A Preliminary Catalogue of Flowering Plants and Higher Cryptogams Growing without Cultivation within 30 Miles of Hanover, 1882.

[3] Ogden, E. C. et al. Check-List of the Vascular Plants of Maine. Bull. of the Josselyn Bot. Soc., No. 8, Aug. 1948.

[4] Benson, L. A Treatise on the North American Ranunculi, Am. Midl. Nat. 40, 1, July 1948.

[5] Rhodora: 1, 93, 1899.

that this collection is the one referred to above by Walter Deane. It is apparent, therefore, that the spotted wintergreen is exceedingly rare in New Hampshire. Inasmuch as there are no reports of it from Maine[3] loc. cit. or specimens in our herbaria from areas farther to the north and east, we may assume that it reaches the northeastern limits of its known range in Lee, New Hampshire.

3. PODOSTEMUM CERATOPHYLLUM Michx.

During the past season the junior author and his co-workers of the N. H. Fish and Game Department Waterfowl Habitat Study discovered three new stations for this species to add to those previously reported by Hodgdon and Krochmal.[6] These stations are as follows: Warner River, Warner, Merrimack County—where abundant; Merrimack River near entrance of brook from Pine Island Pond, Manchester, Hillsboro Co.—scattered; and Suncook River, below bridge on route 28, Barnstead, Belknap Co.—rare. In addition to the above, Prof. N. C. Fassett, in the summer of 1948, sent to the senior author specimens of Podostemum collected in Hillsboro on rocks exposed by low water along highway 9 near junction with 31. This is at or near the Hillsboro station reported in Rhodora[6] loc. cit.

4. IVA FRUTESCENS L. var. ORARIA (Bartlett) Fernald & Griscom.

This species several years ago was reported[7] by the senior author as new to New Hampshire. Recent field studies along the shore of Great Bay and near Portsmouth demonstrate the plant to be locally abundant. In October 1947 specimens were collected by A. R. Hodgdon and D. P. Gangi on Footman's Island in Great Bay in the township of Durham. Three new townships, all in Rockingham Co., have been added to its range by the late 1948 and early 1949 botanizings of the junior author. The specific localities are as follows: Newmarket—shore of Great Bay and Vol's Island; Newcastle—route 1, near Portsmouth; and Portsmouth—near the Newcastle Station. While it might have been expected on the eastern side of the Piscataqua River in Maine, a hasty search of the Elliot and Kittery shores in December 1948 by the junior author proved fruitless. We are finding an increasing number of localized species in southeastern

[6] Rhodora: 50, Aug. 1948.
[7] Rhodora: 46, 22, 1944.

New Hampshire which fail to "bridge the gap" between it and Maine. For some, the river itself would seem to be the barrier.

5. Rhamnus Frangula L.

In view of the abundance and weedy character in Durham of this otherwise infrequent shrub, it seems entirely appropriate to discuss its occurrence in New Hampshire. While it is not listed in the recent check list of the Vascular Plants of Maine[3], several herbarium specimens and a number of published reports attest to its occurrence in Nova Scotia, Quebec, Massachusetts, and Connecticut. A specimen in the Herbarium of the New England Botanical Club from Dublin has been the sole record for New Hampshire.

The senior author has collected this species a number of times in wooded situations or waste-areas in Durham as well as on a partially wooded pasture slope in the township of Northumberland in Coos Co., above the Connecticut River at some distance from a habitation.

In Durham, the presence of ornamental *Rhamnus Frangula* of nearly tree-like proportions in the shrubby border of the President's house in the center of Durham village perhaps explains the source of the fruits and seeds which apparently are carried by birds to wild areas in the general vicinity. This may or may not be a weed of future importance. However, at present it is well established in Durham and is showing signs of rapid spread. Collections have been made in Durham from vigorous plants in three fairly widely separated wooded areas and in addition the species has been observed in some abundance along a Durham road in an open situation.

6. Centaurea solstitialis L.

It is always something of a problem to know how to treat the erratic members of the flora. Barnaby's thistle, while not an abundant weed, has been taken on two separate occasions in widely separated parts of New Hampshire and sent to the University of New Hampshire for identification, once from Claremont in Sullivan County in 1945 and again by Andrew S. Abbott in Bristol in Grafton Co., Aug. 1948. The fragments sent have been put into the University Herbarium and readily serve to permit identification. It is not known whether this species is

persisting or spreading in the state. The Bristol specimens were reported as appearing in a garden following applications of sheep manure. Apparently this species may be expected as a casual adventive in New Hampshire, as it is farther south.

7. SILYBUM MARIANUM (L.) Gaertn.

Ella T. Pearson of Epping, in Rockingham County sent in on October 15, 1946, a large specimen of the Lady's Thistle which had appeared as an adventive in her garden.

8. DIGITALIS LANATA Ehrh.

Mrs. Norma Roberts of Bristol, Grafton County, sent a specimen with the notation "two plants that came up a few feet apart in an old garden—. I have no idea where they could have come from."

Herbarium specimens of the species discussed above are variously distributed in the collections of the New England Botanical Club, the University of New Hampshire, and St. Anselm's College.

UNIVERSITY OF NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION (A. R. H.) AND
NEW HAMPSHIRE STATE FISH AND GAME DEPARTMENT (S. K.)

Vol. 52, no. 617, including pages 77–128 and plate 1161, was issued 10 May, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. July, 1950. No. 619.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

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Subscriptions (making *all remittances* payable to RHODORA) to
Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. **July, 1950** **No. 619**

SOME RESULTS OF A THIRD SUMMER'S BOTANIZING IN OKLAHOMA

U. T. Waterfall

During the summer of 1949 the author continued his investigations of the Oklahoma Flora as Botanist with the Oklahoma Biological Survey, University of Oklahoma. As in the past, the most interesting and taxonomically productive regions have been the Black Mesa area of the Oklahoma panhandle, extreme southwestern and extreme southeastern Oklahoma. The author has listed some of the characteristic species of these areas (Rhodora: **51:** 19–21, 1949 and Rhodora **51**), so it seems needless to repeat them here.

The following enumeration is concerned principally with species which the author has not found recorded from the state, and with distribution notes concerning species rarely collected in Oklahoma. The species believed to be newly reported for the state are prefixed with an asterisk. This assumption is based on checking the plants listed in Jeffs and Little, *A Preliminary List of the Ferns and Seed Plants of Oklahoma* (1930), Stemen and Myers, *Oklahoma Flora* (1937), Featherly, *Manual of the Grasses of Oklahoma* (1946), Hitchcock, *Manual of the Grasses of the United States* (1935), and on available monographs and other publications hereinafter cited. There are 36 such additions recorded. Specimens are usually cited so anyone in the future may know upon what basis these reports rest. The cited material is in the Bebb Herbarium of the University of Oklahoma, unless otherwise stated. Duplicates of the author's collections, when available, will be sent later to a few other herbaria.

ENUMERATION OF SPECIES

*AGROSTIS EXARATA Trin. was collected as *Waterfall* 9105, bed of North Carrizo Creek, 4 miles north of Kenton, Cimarron County, June 27, 1949.

It is not listed from Oklahoma by Featherly (*op. cit.*). Hitchcock (*op. cit:* 336) shows its occurrence in the adjoining states of Colorado and New Mexico. The cited collection has rather dense panicles and unawned lemmas.

*CENCHRUS PAUCIFLORUS Benth. Of 37 sheets of *Cenchrus* in our herbarium, all previously referred to *C. pauciflori*, 36 are representative of *C. longispinus* (Hackel) Fern. One is representative of *C. pauciflorus* Benth. as circumscribed by Fernald.[1] It is *Hopkins* 1004, wet sandy dunes along the Salt Fork of the Red River, 3 mi. west of Altus, Jackson County, October 24, 1936.

*ORYZOPSIS MICRANTHA (Trin. and Rupr.) Thurb. This species was taken as *Waterfall* 9090 in a canyon on the northern slopes of Black Mesa, 3 miles north of Kenton, Cimarron County, June 27, 1949.

Hitchcock (*op. cit:* 416) says it is found "from Saskatchewan to Montana, south to New Mexico and Arizona." The awn is early deciduous.

*PANICUM RAMISETUM Scribn. This species was collected as *Waterfall* 8990, mixed gypsum and dolomite, low hill south of Buck Creek, 4 miles west and 6½ miles south of Hollis, Harmon County, June 14, 1949.

Hitchcock (*Manual of Grasses of the United States:* 612. 1935) states that the range of the species is southern Texas and Northern Mexico. In the Bebb Herbarium of the University of Oklahoma the nearest collection is *Charles Smith* 131, 12 miles northwest of San Angelo, Tom Green County, Texas.

SPOROBOLUS GIGANTEUS Nash was taken as *Waterfall* 9039 from the Waynoka sand dunes, north of the Cimarron River south of Waynoka, Woods County, June 24, 1949.

According to Hitchcock (*op. cit.:* 406) the then known range of *S. giganteus* was "western Texas to Arizona". Featherly (*op. cit.:* 59) says that it has been collected in Woodward County.

TRISETUM INTERRUPTUM Buckl. In Hitchcock (*op. cit.:* 287) the range is given as being from Texas to Colorado and Arizona. Featherly (*op. cit.:* 61) says it is found in Payne County, Okla-

[1] Fernald, M. L. *Virginia Botanizing Under Restrictions.* RHODORA 45: 387–388. 1943.

homa. We have this species as *Jack Engleman* 166, Blaine County, April 26, 1937, and as *Waterfall* 8926, overgrazed pasture on red sandstone of the Quartermaster Formation, 11 miles south of Cheyenne, Roger Mills County, June 13, 1949.

*Eleocharis geniculata (L.) R. and S. (*E. caribaea* (Rottb.) Blake). So referred is *Waterfall* 3102, bank of pond south of fairgrounds, Oklahoma City, Oklahoma County, July 26, 1941.

This is not in the list of Jeffs and Little (*op. cit.*), and I do not find it elsewhere recorded from the state.

*Eleocharis parvula (R. & S.) Link, var. anachaeta (Torr.) Svens. So determined is *Waterfall* 3102 (a), bank of pond south of fairgrounds, Oklahoma City, Oklahoma County, July 26, 1941.

In his distribution map of var. *anachaeta* Svenson (Rhodora: **36:** 387. 1934) maps an ellipse which includes Oklahoma, but shows no dots representing collections from the state.

*Scirpus saximontanus Fernald. We have this species as *Penfound* 381, in shallow water, upper burhead zone, Gate Playa, near Gate, Beaver County, August 16, 1949.

When describing *S. saximontanus* Fernald (Rhodora: **3:** 251. 1901) cited specimens from Colorado, Texas and San Luis Potosi.

Polygonum dumetorum L., forma cristatum (Engelm. and Gray) Robinson. At the University of Oklahoma there is one sheet so referred. It is *Waterfall* 1770, open woods, 5¾ miles west of Oklahoma City, Oklahoma County, September 11, 1939.

Rumex pulcher L., ssp. divaricatus (L.) Murb. The material of *R. pulcher* so far collected in southeastern Oklahoma appears referrable to ssp. *divaricatus* as described by Rechinger.[1] The leaves are not panduriform, and the toothed valves of the fruit are about as long as broad, as is described for ssp. *divaricatus*.

*Eurotia lanata (Pursh) Moq. This species was collected as *Waterfall* 9230, top of Black Mesa, 3 miles north and 1 mile east of Kenton, Cimarron County, August 9, 1949.

*Alternanthera repens (L.) Kuntze. Referred to this species are plants collected as *Waterfall* 9159, roadside, Marietta, Love County, July 15, 1949.

Cory (*op. cit.*) lists it from the adjacent Blackland Prairie area of Texas.

*Amaranthus albus L., var. pubescens (Uline & Bray) Fern. So assigned are several sheets of *A. albus* (*A. graecizans*

[1] Rechinger, K. H., *The North American Species of Rumex*, Field Mus. Nat. Hist.—Bot. **17**: 130. 1937.

of auths.) which are viscid-puberulent, but not densely so. Representative are: *Rotha Bull* 299, 3 miles northwest of Granite, Greer County, August 9, 1931, and *McMurry* 538, Wichita Mountains, Comanche County, August 22, 1938.

Var. *pubescens* ("densely viscid-puberulent") is said to occur from "Nevada to southern Colorado and New Mexico." (*N. Am. Fl.* **21** (2): 116. 1917).

*AMARANTHUS SCLEROPOIDES Uline and Bray. So referred is material collected as *Waterfall* 8596, 3 miles west of Orienta, Major County, August 20, 1948.

In the North American Flora (**21** (2): 104. 1917) this species is said to occur in central and western Texas.

*PORTULACA LANCEOLATA Engelm. This species is easily recognized by the winged capsule-rim. We have at the Bebb Herbarium of the University of Oklahoma *Demaree* 13013, North Cache Creek, Medicine Park, June 19, 1936.

In the North American Flora (**21** (4): 330. 1932) the distribution is stated as being "western Texas to Arizona and Lower California; Georgia; Cuba and Jamaica". It is interesting to note that the type locality is "Granite region of western Texas", and that the Wichita Mountains are predominantly granite.

DELPHINIUM VIRESCENS Nutt. (TYPICAL).

In Jeffs and Little's *Preliminary List . . . D. Penardi* Huth is found in the synonymy of *D. virescens* Nutt. The material in our herbarium that was available for study prior to the time of that publication has all been assigned to typical *D. virescens* by Ewan.

D. VIRESCENS, ssp. PENARDI (Huth.) Ewan. The monographer of the genus when studying our material in 1944 annotated two sheets as ssp. *Penardi*. They are: *Goodman* 2569, sides of butte, 8 miles south of Watonga, Blaine County, May 25, 1935, and *Goodman* 2619a, Antelope Hills, Roger Mills County, May 26, 1935.

*D. VIRESCENS, ssp. WOOTONI (Rydb.) Ewan. So annotated by Ewan is *Demaree* 12362, low hills, Carmen, Alfalfa County, May 1, 1936.

LINDERA BENZOIN (L.) Blume, var. PUBESCENS (Palm. and Steyerm.) Rehder, (*Benzoin aestivale* (L.) Nees, var. *pubescens* Palm. and Steyerm. *Ann. Mo. Bot. Gar.* **22:** 545. 1935.)

The range given by Palmer and Steyermark when they described the pubescent vaiety (*loc. cit.*) included Oklahoma. Of

the 16 sheets we have in our herbarium from the eastern part of the state, 10 are var. *pubescens*, and 6 are of the glabrous var. *typica*.

*Draba reptans (Lam.) Fern., var. micrantha (Nutt.) Fern. Of 59 sheets of *D. reptans* from Oklahoma in our herbarium, 57 sheets are the typical glabrous-fruited var. *typica*. Two are referrable to the hispid-fruited var. *micrantha*. They are: *Couch* C-3, Arbuckle Mountains, Murray County, March 6, 1938, and *Stevens* A3055.2, without data.

Fernald[1] states that the range of var. *micrantha* is from "Louisiana to southern California, north to Illinois, Minnesota, South Dakota, Montana and Washington".

*Sisymbrium officinale (L.) Scop., var. leiocarpum DC. Of the 6 sheets of *S. officinale* in our herbarium 5 have glabrous fruits, the other one has the pubescent fruits of the typical variety.

*Physocarpus opulifolius (L.) Maxim., var. intermedius (Rydb.) Robins. This species was collected as *Waterfall* 9198, wooded calcareous slopes, 3 miles west and 2½ north of the state line west of Siloam Springs, Delaware County, July 27, 1949.

It has been collected previously in Arkansas (*Gray's Manual*, ed. 7: 456).

*Astragalus austrinus (Small) E. D. Schultz. So referred is *Waterfall* 7800, shallow sand on gypsum, 4 miles east and 4 south of El Dorado, Jackson County, June 5, 1948.

Cory (*op. cit.*) lists this species from the adjacent Plains area of Texas. Rydberg (*N. Am. Fl.* **24** (7): 431. 1924.) says that it ranges from "Texas to Colorado, Utah, Lower California and Durango."

*Astragalus humistratus Gray. So referred is *Waterfall* 9077, top of Black Mesa, 2 miles north of Kenton, Cimarron County, June 27, 1949.

In the North American Flora (**24** (6): 315. 1929.) this species is said to occur from southern Colorado to Chihuahua and Arizona.

Astragalus Lindheimeri Gray. At the Bebb Herbarium of the University of Oklahoma this species is represented by *Waterfall* 7819, saline plain, 4½ miles south of Hollister, Tillman

[1] Fernald, M. L., *Draba in temperate Northeastern America.* Rhodora **36**: 368. 1934.

County, June 5, 1948. In the herbarium of Oklahoma A. & M. College there is a sheet, *Louise Perrin* 40, one mile north of Altus, Jackson County, April 18, 1937.

Rydberg (*N. Am. Fl.* **24** (7): 428. 1929.) restricts its distribution to Texas.

DALEA NANA Torr. The only location from which the author has found this species in Oklahoma is in the stabilized sand-dunes west of Boise City, Cimarron County, where it was collected as *Waterfall* 9052.

*MODIOLA CAROLINIANA (L.) G. Don. was collected as *Waterfall*, 8888, edge of woods along road, 4 miles south and 2 miles east of Tom, McCurtain County, June 6, 1949.

In our country this monotypic genus has been known previously[1] from Florida to Texas and Virginia.

OENOTHERA CANESCENS Torr. and Frem.

This species had been collected in Texas, near Amarillo, and in Kansas, including the type (*Am. Journ. Bot.* **19:** 767. 1932). Therefore it should be expected in the Oklahoma panhandle. Penfound has collected it in Hitchland Playa, near Hitchland, Texas County (*Penfound* 351), but the map shows the playa to be just over the state line in Texas. He states that he has seen it in Griggs Playa, Cimarron County, but we have no confirmatory herbarium specimen. Since the species is so distinct from other Oklahoma Oenotheras we may be fairly certain that it occurs in the state, but confirmation, by way of herbarium material, is still needed.

*ASCLEPIAS MACROTIS Torr. Although the present author mentioned *A. macrotis* as an associate of *Sarcostemma lobatum* when he described the latter (RHODORA **51:** 59. 1949), it apparently has not been otherwise reported as a part of the state flora. We have several collections of *A. macrotis*, all from the mesa area of northwestern Cimarron County.

*ASCLEPIAS OBOVATA Ell. This species has been collected as *Waterfall* 8102, prairie 2 miles southeast of Talihina, Le Flore County, June 24, 1948, and as *Waterfall* 8405, silty soil 20 miles southeast of Atoka, Atoka County.

Cory (*op. cit.*) records *A. obovata* from adjacent areas in eastern Texas.

[1] Small, J. K., *Manual of the Southeastern Flora.* 1933.

*Asclepias viridiflora Raf., var. linearis Gray. We have this variety as *Eskew* 531, 1 mile southwest of Blanchard, Grady County, July 29, 1936, and *Waterfall* 7903, slopes of Black Mesa, 3 miles north and 1 mile west of Kenton, Cimarron County, June 13, 1948.

The lateral veins in the leaves of var. *linearis* seem to be much less prominent and are more ascending than in the typical variety.

Gilia rigidula Benth., var. acerosa Gray. In Oklahoma the author has found this plant only from the caliche ridges east of Guymon in Texas County. It is represented by *Waterfall* 9056.

*Myosotis macrosperma Engelm. In the folders of *M. verna* I find 3 sheets referrable to *M. macrosperma* as the two are differentiated by Fernald.[1] They are: *Hopkins* and *Cross* 1764, swampy woods 2 miles south of Talihina, LeFlore County, May 6, 1937; *M. Hopkins, Aven* and *Ruth Nelson* 1056, low woods near creek, 3 miles south of Lehigh, Coal County; *Aven* and *Ruth Nelson* and *George Goodman* 5601, shaded rocky stream bank, 15 miles north of Broken Bow, McCurtain County, April 21, 1946.

*Physalis Fendleri Gray. This species has been collected as *Demaree* 13388, top of bluff, John Regnier Ranch, Kenton, Cimarron County, July 28, 1936. We also have *Waterfall* 3155, 7891 and 7915, all so referrable, and all collected from the mesa area of northwestern Cimarron County.

Physalis hederaefolia Gray, var. **comata** (Rydb.), stat. nov. (*P. comata* Rydb. *Bull. Torr. Bot. Cl.* **22:** 306. 1895). In the western part of the Oklahoma panhandle we have a *Physalis* that looks like *P. hederaefolia,* but has long (1–2 mm.) flat jointed hairs scattered on the stem, leaves and calyces among the abundant viscid capitate hairs. These plants the author is referring to var. *comata.* Typical *P. hederaefolia* may have a villous pubescence, of somewhat jointed hairs (up to half as long as in var. *comata*) mixed with the short capitate glandular hairs, but the pubescence seems to be denser and shorter. Referred to var. *comata* are: *Waterfall* 7867, 14 miles east of Hooker, Texas County, June 11, 1948; *Waterfall* 7445, plains north of the Black Mesa, north of Kenton, Cimarron County, July 9, 1947; *Waterfall* 9240, northeast slopes of the Black Mesa, 3 miles north and 1 east of Kenton, Cimarron County, August 10, 1949.

Physalis mollis Nutt., var. cinerascens (Dunal) Gray. Although our current manuals and check-list do not mention this variety, it is recorded by Rydberg[2] from both "Indian Territory"

[1] Fernald, M. L., *Another Century of Additions to the Flora of Virginia.* Rhodora **43:** 637. 1941.

[2] Rydberg, P. A. *The North American Species of Physalis and related Genera.* Mem. Torr. Bot. Cl. **4** (5): 355. 1896.

and "Oklahoma Territory," roughly, eastern and western Oklahoma. We have several sheets in our herbarium.

*SOLANUM ELEAEGNIFOLIUM Cav., f. ALBIFLORUM Cockrell. The white-flowered form was collected as *Waterfall* 7748, plains 5 miles north of Mangum, Greer County, June 2, 1948.

*DYSCHORISTE LINEARIS (T. and G. apud Engelm. and Gray) Ktze. This species was collected in 1949 as follows: *Waterfall* 9020, short grass pasture, 4½ miles east of Grandfield in Cotton County, June 16; *Waterfall* 9164, on limestone hill 7 miles west and 1 south of Marietta, Love County, July 15; *Waterfall* 9167, "breaks" along Red River 6 miles south and 2½ west of Randlette, Cotton County, July 15. Here it was very abundant.

Kobuski[1] cites specimens from Texas, New Mexico and Mexico. In the Herbarium of Southern Methodist University there are two specimens from Cooke County, Texas, which is adjacent to Love County, Oklahoma. They are: *Whitehouse* 15831, 10 miles south of Gainesville, May 24, 1946; *D. S. Correll and H. B. Correll* 12970, rocky soil, western end of county.

VIBURNUM DENTATUM L., sensu Svenson in RHODORA **42:** 5. 1940, and Fernald, RHODORA **43:** 647. 1941. I am referring to this species *Waterfall* 8826, wooded hill, 11 miles south of Bethel, McCurtain County, June 4, 1949.

The fruits are glandular, as are the pedicels, peduncles and upper stem parts; the petioles are hirsute and glandular. Most of the leaf blades are about 8 cm. long and 8 cm. wide, or 8 long and 7 wide, or 9 long and 8 wide; the veins are sparingly pubescent beneath with simple hairs, or with a few capitate-glandular ones; the axils of the veins are quite pubescent. There are a few scattered hairs elsewhere on the lower and also on the upper leaf surfaces. The margins are coarsely dentate to sinuately dentate. We also have *Little* and *Olmstead* 466, as *Viburnum affine*, var. "*hypoleucum*" (*hypomalacum* Blake), gravel flood plain, Highway 21, north of Cedar Creek, McCurtain County, June 30, 1930. The leaves are smaller, and the blades being mostly about 5 cm. long and 3 to 4½ cm. wide with margins varying from coarsely dentate, through crenately undulate, to almost entire. They are not "*subtus dense pilosa*" as Blake described var. *hypomalacum* (RHODORA **20:** 14. 1918), but have only a few scattered hairs between the veins of the under leaf surfaces. These data appear

[1] Kobuski, Clarence Emmeren. *A Monograph of the American Species of the Genus Dyschoriste.* Ann. Mo. Bot. Gar. **15:** 36–39. 1928.

to offer further evidence in accordance with Fernald's statement (RHODORA **43:** 647–562. 1941) that leaf size, shape, outline and degree of pubescence seem not to be sufficiently constant, or geographically correlated, to use as a basis for the recognition of species or, possibly, of varieties in this species-concept.

*AMBROSIA ARTEMISIAEFOLIA L., var. ELATIOR (L.) Descourtils, forma VILLOSA Fern. and Grisc. Of 20 sheets of *A. artemisaefolia* var. *elatior* in our herbarium 3 are referrable to forma *villosa*.

*ASTER HEMAESPHERICUS Alexander. So referred are plants collected as *Waterfall* 8537, prairie 12 miles east of Haleyville, Latimer County, August 9, 1948.

They have the long rootstocks which the author of the species describes as characteristic. I am not familiar enough with *A. pedionomus* to satisfy myself concerning the specific distinctness of the two. The range of the two species is said[1] to include Kansas and Texas, therefore, by inference, Oklahoma.

*BRICKELLIA BRACHYPHYLLA Gray. So referred are: *Waterfall* 8657, north slopes of Black Mesa, 2½ miles north and 1 west of Kenton, Cimarron County, August 23, 1948; *Waterfall* 9244, northeast slopes of Black Mesa, 3 miles north and 1 east of Kenton, Cimarron County, August 10, 1949; *Waterfall* 9223, low stony slopes, 8 miles east of Kenton, Cimarron County, August 9, 1949.

This material has the subplumose pappus, few involucre-bracts, and ovate-lanceolate to lanceolate, sessile or subsessile leaves of *B. brachyphylla*. Robinson (*Mem. Gray Herb.* **1:** 46. 1917) states that this species occurs in Texas, Colorado, New Mexico and Arizona, with most of the cited specimens being from New Mexico.

*BRICKELLIA CALIFORNICA (T. and G.) Gray. We have this species as *Waterfall* 8639, sandstone buttes, 8½ miles east and 1 mile south of Kenton, Cimarron County, August 22, 1948, and as *Waterfall* 8692, sandstone buttes south of Tesequite Creek, 1 mile west and 4 south of Kenton, Cimarron County, August 24, 1948.

*CHRYSOTHAMNUS NAUSEOSUS (Pall.) Britt., near ssp. TYPICUS Hall and Clements. So referred is *Waterfall* 9226, plains ½ mile north of Kenton, Cimarron County, August 9, 1949, and *Wm. E. Baker*, Cimarron County, summer 1935.

[1] Small, J. K. *Manual of the Southeastern Flora:* 1391. 1933.

Hall and Clements[1] say that it is "especially common in Wyoming and eastern Colorado".

*CIRSIUM HORRIDULUM Mich. This species was collected as *Waterfall* 8887, in pasture along small creek south of Tom, McCurtain County, June 6, 1949.

According to Cory (*op. cit.*) it is known from adjacent areas in Texas.

*EUPATORIUM RUGOSUM Houtt., var. ANGUSTATUM (Gray) Blake. *Hopkins* and *Van Valkenburgh* 6167, deep rich swampy woods in flood plain of the Little River, 6 miles north of Idabel, McCurtain County, October 12, 1941, has the acuminate, coarsely serrate leaves with cuneate bases as described for var. *angustatum*[2, 3] of western Louisiana and Texas.

*FRANSERIA ACANTHICARPA (Hook.) Coville. The genus *Franseria* is recorded by neither Jeffs and Little (*op. cit.*) nor Stemen and Myers (*op. cit.*). The range of *F. acanthicarpa* as stated in the North American Flora, (**33** (1): 25. 1922.), "Saskatchewan and Alberta to Missouri, Texas and southern California," might be taken as inclusive of Oklahoma. We have the species as *Waterfall* 9257, valley of Carrizo Creek, 6 miles north of Kenton, Cimarron County, August 11, 1949.

In the fall of 1948, Mr. Stemen, who now collects pollen and other allergens on a commercial basis, brought to the author some young material of a *Franseria* which he believed, apparently correctly, as referrable to *F. acanthicarpa.*

FRANSERIA CONFERTIFLORA (D. C.) Rydb. We have several collections of this species from the western part of the Oklahoma panhandle. Rydberg included Oklahoma in his statement of the species distribution (*N. Am. Fl.* **33** (1): 28. 1922.). It is to be noted that 3 species of *Franseria* are now known from Oklahoma, the above two and *F. tomentosa* reported in RHODORA **45:** 116. 1943.

*GNAPHALIUM CHILENSE Spreng. So referred is *Glassman* 1286, top of Mt. Scott, Wichita Mountains, October 26, 1947.

*GNAPHALIUM WRIGHTII Gray. This species was collected as *Waterfall* 8691, sandstone buttes south of Tesequite Creek, 1 mile west and 4 south of Kenton, Cimarron County, August 24, 1948.

Growing in the same vicinity were *Pinus ponderosa, P. edulis, Juniperus monosperma, Muhlenbergia Porteri, Asclepias macrotis,*

[1] Hall, Harvey M. and Frederic E. Clements. *The Phylogenetic Method in Taxonomy.* Carneg. Inst. Wash. Publ. 326. 1923.

[2] Gray, Asa. *Synoptical Flora* **1** (2): 101. 1884.

[3] Fernald, M. L. *Seventh Century of Additions to the Flora of Virginia.* RHODORA, **44**: 463. 1942.

Penstemon Fendleri and *Pericome glandulosa*. *G. Wrightii* has been previously known from the adjoining state of New Mexico.

LIATRIS PUNCTATA Hook., var. **coloradensis** (Gaiser), stat. nov., (*L. punctata* Hook., var. *typica* Gaiser, forma *coloradensis* Gaiser, RHODORA **48:** 351. 1946).

In the western part of the Oklahoma Panhandle, where it is common, *L. punctata* has the purple, mucronate involucre bracts as described in Gaiser's forma *coloradensis*. I have not found var. *typica* present in this area. Thus var. *coloradensis* seems to be distinct geographically in at least a part of its range from var. *typica*.

*VERNONIA BALDWINII Torr., var. INTERIOR (Small) Schub., forma **alba,** f. nov., corrollis albidis. TYPE: *Waterfall* 8472, edge of Clear Lake, 3 miles south and 2 west of Tom, McCurtian County, August 7, 1948. The *type* is in the Bebb Herbarium of the University of Oklahoma.

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NEED FOR CAUTION REGARDING CERTAIN COLLECTIONS

M. L. FERNALD

ONE of the greatest sources of confusion regarding the detailed or the broad ranges of plants is the lack of appreciation in the past, and sometimes in present times, of the sacredness of original data and the danger in labels not coming directly from the collector. The misinformation through which Linnaeus named plants, indigenous only in eastern North America, *Athamanta chinensis* (this becoming *Conioselinum chinense* (L.) BSP.) and *Hydrocotyle chinense* (the coastal *Lilaeopsis chinensis* (L.) Ktze.) is repeated for various plants with other wholly inappropriate or misleading names. Similarly, Michaux too often had on his labels geographic data strikingly contradicting the published statement or, as in the case of his *Angelica triquinata*, evidently written from memory or through confusion of geographic names. His *Angelica triquinata*, "*Hab.* in Canada", is a good example.

The photograph of his type cannot be matched with anything Canadian but, as shown in Rhodora, xlv. 298–300, plates 768 and 769 (1943), it was the plant described fifty years later as *A. Curtisii* Buckley, from North Carolina. By clerical error, apparently, Canada had been written instead of Carolina.

Such errors were too frequent in Linnaean and early post-Linnaean days and in the organizing of collections from somewhat unfamiliar territory, which were handled by others than the original collectors or which were loose in sheets and not mounted and organized until after the collector's death (as in case of Michaux's material); but an even more confusing practice was one which prevailed a century or so ago. Field-explorers, visiting new regions, collected plants new to their experience from several localities each, giving them field-numbers or otherwise (by locality, date, etc.) indicating them as seemingly different. These vast collections, brought or sent back to the sponsoring institutions, whether in Europe or America, were "lumped" by those who lacked the field-appreciation of them, and material from utterly different localities was distributed as all coming from a single station. Such confusions, with wholly different collections represented in the older herbaria as if one, and with the exact localities lost, are tantalizingly numerous and have led and still lead to many misinterpretations. These are short-sighted practices of the past, with misinterpretations which will always continue unless some future enthusiast has the time and necessary funds to visit all the leading herbaria of the period and properly to identify the confused elements and the wholly inconsistent paratypes.

My immediate purpose in this note, however, is not to expand on that familiar source of confusion, but to call attention to a large collection of plants of New England and New York which had similar treatment and which, distributed broadcast as duplicates, is bound to cause confusion. Rev. Joseph Blake (1814–1888) was an enthusiastic amateur botanist who at various times had pastorates at different towns in Maine, New Hampshire, Massachusetts and New York. At all these centers he collected assiduously and in great duplication. At his death his vast herbarium went to the Maine State College (now the University of Maine), where it was organized and overhauled by an instruc-

tor of keen enthusiasm. Being a young beginner in botany, I spent all time out of school-hours watching the process which was very simple: a specimen of each collection, with Blake's label, was set aside for preservation; then all duplicates of any number of collections supposed to be of one species were dumped into one cover, some one of the diverse labels copied and eventually all the duplicates, whether from Harrison (Maine), Wells (Maine), Gilmanton (New Hampshire), Willoughby or Smuggler's Notch (Vermont), Andover (Massachusetts), somewhere in New York or some other region, were distributed to other herbaria. The authenticity of data (and identity of plant) on labels of the duplicates, collected by Blake, is to be mistrusted and, if accepted, will often lead to error.

Another perpetual source of error is the label which emphasizes the home-address of the collector rather than the locality for the plant. George Engelmann had such a label and too often he forgot to give the locality for the specimen sent out, so that one has to be on guard. Allied to this source of error are the cases where two or more names of collectors appear on a label, but in which the collector's data has been carelessly forgotten, so that identical material is distributed by no. 1 as from one region but by no. 2 as from another (often in a state whence the plant is really unknown).

Similar sources of error might be enumerated but only two others, these seriously concerning records from Maine, will be here noted. Kate Furbish was an enthusuastic painter of the flowering plants of Maine and her wonderfully accurate illustrations (life-size) are invaluable. She kept no organized herbarium, but had many loosely tied newspaper-packages of pressed plants massed into a few deep mounds, with scores of species in one fold of paper. The packages had somewhere a memorandum "Fort Kent plants, 1880", or "Wells" or other locality and often the date. In November, 1908, when she was approaching her 75th birthday, Miss Furbish shipped to the New England Botanical Club her vast accumulation of loose material. As the then functioning Curator, I sorted the material and, with the aid of students, innocently (and, we supposed, helpfully) had labels made. One of them on a poor bit of *Rhexia virginica* bears the data "Fort Kent, Maine, July, 1880".

Now, so far as we actually know, *Rhexia* reaches its northern limit in central Maine in the acid peaty borders of Chimo Pond in Bradley, Penobscot County, about 150 miles south of the calcareous region of Fort Kent. At any rate, in 1891, while spending her summer at Orono, hearing that *Rhexia*, which she had "always wanted to see", occurred at Chimo, she was taken there by the late Fred P. Briggs. Briggs's account of her excitement on first seeing it was amusing. Jumping up in the boat and nearly capsizing it, she delightedly shouted: "Goody! goody! *Rhexia!* No wonder they call it the king of the flowers"; but that does not prove that she had unknowingly found it eleven years earlier at Fort Kent! One other of the products from Miss Furbish's packages came from a bundle marked "West Baldwin, September 10, 1900". This is a bit of *Cardamine bellidifolia*, definitely known in Maine only from alpine areas of Mt. Katahdin. Nevertheless, there is the label, reading: "Crevices of granite rocks in bed of mountain stream, West Baldwin, Sept. 10, 1900". The solution is as follows. Miss Furbish spent the summer of 1900 at West Baldwin in the Saco Valley, a region of low forested hills, without anything suggesting alpine conditions. Coming out from Mt. Katahdin in mid-July, 1900, I carefully packed in wet moss fresh plants, including the Cardamine, of species which I thought would be new to her, and sent them to West Baldwin. *Cardamine bellidifolia* was eventually tucked in with other plants collected or received by her at West Baldwin. Regretting to record such unintentional errors by one whom everyone admired and greatly respected, the facts are important as clarifying the situation, for she did not realize that the notes on her packages would be taken too literally.

One other case which concerns Maine records is that of a collection of identified plants passed in at the end of the spring-term at Orono, as collected at Shapleigh, York County, Maine. The student handing in the series could pray or exhort for half-an-hour at a stretch at Y. M. C. A. or Christian Endeavor meetings and during the spring-term had returned home on account of illness. The collection from "Shapleigh" was remarkable in containing several calcicolous species never before known from Maine. Somewhat later, the Josselyn Botanical Society of Maine went to the acid region of Shapleigh and hunted in vain

for them. When he was written to and asked to make known the stations, his reply was, that before transferring to Maine State he had spent a year at Massachusetts State College at Amherst, and that it was possible that some of the Amherst plants had got mixed in. He certainly needed to pray.

The upshot is, obviously, that great care must be exercised in accepting data from those who do not realize its importance, and that all of us should see that our own statements on labels are quite accurate. Gradually we learn that even the complimentary placing of names on the label of non-botanical members of a party or those who have had no part in the collecting may become embarrassing. Enough said!

SYNONYMY IN VIBURNUM OBOVATUM AND V. CASSINOIDES

Wilbur H. Duncan

A specimen labeled *Viburnum corymbosum* (Miller) Rehder was among a set of exchange plants recently received at the University of Georgia Herbarium. The specimen is obviously *V. obovatum* Walter, a species found in the Coastal Plain from Florida to Virginia, an area containing no closely similar relatives. I wondered about the status of the former name and attempted to find it in publications at my immediate disposal. It is neither listed in the Index Kewensis (including 9 supplements) nor included in Rehder (Manual of Cult. Trees & Shrubs: 1940; and Bibliography of Cult. Trees & Shrubs: 1949), Bailey (Manual of Cultivated Plants. Rev.: 1949), Robinson and Fernald (Gray's New Manual of Botany, Ed. 7.: 1908), Small (Flora of S. E. States: 1933), and other manuals. Shortly after these preliminary efforts I visited the Gray Herbarium and continued the search for published matter connected with the name. The Gray Card Index includes no reference to the *V. corymbosum* above but does cite *Viburnum corymbosum* Urb. (Fedde. Rep. Spec. Nov. **18:** 121, published 15 August, 1922) which is found in Cuba and differs considerably from the material in question.

Rehder's interpretation of the synonymy was eventually found as a footnote in Journal Arnold Arb. **3:** 214. 28 December, 1922. *V. corymbosum* (Miller) Rehder is, therefore, a later homonym

and is illegitimate, being published over four months later than *V. corymbosum* Urb. Furthermore, in my opinion, Rehder erred in this application of *V. corymbosum* to our southeastern *V. obovatum*. He states that "Though the figure published by Miller (Fig. Pl. L. 55, t. 83, fig. 1. [1760]) and cited under his *Cassine corymbosa* is not exactly typical for the species in question, it cannot be referred to any other species than *Viburnum obovatum* Walter, ——." It should be pointed out that Miller's description of figure 1, "Cassine foliis ovato-lanceolatis serratis oppositis deciduis, floribus corymbosis", does not match as to general leaf-shape and -margin any of the collections (including those at the Gray Herbarium) I have seen of this species. When the margins of the leaves in the drawing are examined carefully, it may be seen that they are indicated by faint but definite lines as being decidedly serrate. The coloring in the drawing follows a more or less straight line at the leaf margins and might easily mislead a casual observer. Miller's description and figure are much more readily referred to material of *Viburnum cassinoides* L. (sensu Gray's Manual of Botany, 7 ed. 1908 and Small (1933), Manual of the Southeastern Flora). In this species the leaves are occasionally serrate and ovate-lanceolate, whereas those of *V. obovatum* are faintly dentate-undulate to entire and are never ovate-lanceolate.

Miller (Garden Dict. Ed. 8: 1768) undoubtedly had seen material of *V. obovatum*, in as much as it was known in cultivation in England before that time. The description of one of his listed species should, therefore, be such as would include *V. obovatum*. If this species can be included only under his *Cassine corymbosum*, then the contention that Miller's *Cassine corymbosum* is a synonym of *Viburnum cassinoides* L. would be greatly weakened. On the other hand, if *V. obovatum* should come under another description of Miller's, then the above contention would be strengthened. The answer as to how Miller classified this species is partly tied up in the synonymy of *V. cassionoides* L. and sensu Willdenow.

Although *Viburnum cassinoides* Willd. (Sp. Pl. **1:** 1491. 1798) is listed as a synonym of *V. obovatum* (Hooker f. & Jackson 1895. Index Kewensis, p. 1194), I do not know upon what basis this was done for Willdenow's treatment indicates that he correctly inter-

preted and followed Linnaeus (Sp. Pl. ed. 2: 384. 1762). Willdenow's (Sp. Pl. ed 1. Vol. 1. pars. 2: 149. 1798) description, "Folia infima obovata; proxima ovata; superiora lanceolata", is identical with that of Linneaus and he cites specifically "Sp. pl. 384." In addition Willdenow lists Aiton, 1789 (Hortus. Kewensis 1. p. 370), who cites *V. cassinoides* of Linneaus (Sp. pl. 384.) as a synonym, although qualifying the citation with "exclusis synonymis." Aiton also describes the plant with "foliis lanceolatis laevibus margine revolutis obsolete crenulatis," a description that certainly more nearly matches our present conception of *V. cassinoides* L. than that of *V. obovatum.* Houttuyn, Lin. Pfl. Syst. 3, p. 357, cited by Willdenow, apparently gives the only reasonably good connection with the latter species. In this reference there is cited Miller, Garden Dictionary (presumably ed 8. 1768), species 9, *V.* (*Cassinoides*), under which appears, "The ninth sort grows naturally in S. C.: this has a shrubby stalk —; these are garnished with oval leaves about one inch long and more than half an inch broad, —." The length of leaves and range for the species strongly suggest *V. obovatum.* If Willdenow had in mind this species, then he likely would have cited specifically Miller's apparent description of it. *V. cassinoides* sensu Willd. is the same as that of Linnaeus. *Cassine corymbosa* (Miller, 1768) is not, therefore, referable to *V. obovatum* as Rehder (1922) contends. It is more likely referable to *V. cassinoides* L.

A final consideration seems pertinent. Did Linnaeus recognize *V. obovatum* as an entity under some other name and thus give us an earlier name than *V. obovatum?* A careful check was made through his descriptions and the photographs of specimens in the Linnaean Herbarium. Attention was returned to Linnaeus' description of *V. cassinoides,* especially because of his use of "Folia imfima obovata; —", a character certainly true of *V. obovatum,* and not characteristic of the former species. The photograph (No. 379.12) of the specimen labeled *Viburnum cassinoides* in the Linnaean Herbarium, however, indicates that a dwarfed lower leaf (on a very short lateral spur) is obovate and small, while the others are occasionally ovate and sometimes broadly lanceolate. The specimen is obviously of *V. cassinoides* (in the present general sense) with an abnormal lower leaf.

No other description by Linnaeus seems to single out or especially indicate that *V. obovatum* is included. One possibility appears, however, when other photographs of specimens in his herbarium are examined. Photograph number 380.3 is of a specimen that might be *V. obovatum*. This sheet, however, is labeled *Cassine Peragua* and is pinned to the previous sheet (Photograph No. 380.2) which is labeled the same but with later different annotations. The latter specimen is definitely not *V. obovatum*. It would seem, therefore, that Linnaeus did not recognize *V. obovatum* as an entity under any other name, and Walter's name, therefore, stands.

In order to enable others to make easy use of the data presented here a complete synonymy (in so far as material was covered in this study) is given of both *V. obovatum* and *V. cassinoides*, including certain references to nomenclatural and taxonomic treatments.

VIBURNUM CASSINOIDES L., Sp. Pl. Ed. 2: 384. 1762. Aiton, Hortus Kewensis: 370. 1789. Willdenow, Sp. Pl. I: 1491. 1798. Pursh, Flora Amer. Sept.: 201. 1814. non *V. cassinoides* Willd. sensu Hooker f. & Jackson, Index Kewensis: 1194. 1895. Chapman, Flora of Southern States. Ed. 3: 1897. Robinson & Fernald, Gray's New Manual of Botany. Ed. 7.: 1908. Britton & Brown, Ill. Flora of North. U. S. & Canada: 1913. Small, Flora of the S. E. States: 1933. Rehder, Manual of Cult. Trees & Shrubs. Ed. 2. Rev.: 1940. Bailey, Manual of Cultivated Plants. Rev.: 1949.

Cassine corymbosa Miller, Garden Dictionary. Ed. 8: 1768. Fig. Pl.: Plat. 83. f. 1. 1760.

Cassine peragua Houttuyn, Lin. Pfl. Syst. Vol. 3: 357. 1773. non Miller, Garden Dictionary: 1768.

Viburnum pyrifolium Pursh, Flora Amer. Sept.: 201. 1814.

Viburnum nudum var. *cassinoides* Torrey & Gray, Flora N. Amer. 2: 16. 1841.

Viburnum corymbosum (Miller) Rehder, Jour. Arnold Arb. 3: 214. Dec. 1922. non *V. corymbosum* Urb., Fedde. Rep. Spec. Nov. 18: 121. Aug. 1922.

VIBURNUM OBOVATUM Walter, Flora Caroliniana: 116. 1788. Pursh, Flora Amer. Sept. 201. 1814. Chapman, Flora of the Southern States. Ed. 3: 1897. Small, Flora of S. E. States: 1933.

V. cassinoides Miller, Garden Dictionary. Ed. 8: 1768. Houttuyn, Lin. Pfl. Syst. Vol. 3: 357. 1773. *Later homonym.*

V. cassinoides L. sensu Michx., Flora Bor. Amer. 1: 179. 1803.

V. cassinoides Willd. sensu Hooker f. & Jackson, Index Kewensis: 1194. 1895.

Viburnum corymbosum (Miller) sensu Rehder, Jour. Arnold Arb. 3: 214. Dec. 1922. *Later homonym.*

The use of facilities at the Gray Herbaium where a portion of this study was done is greatly appreciated. The visit at Cambridge was made possible by a research grant through Dr. George H. Boyd, Dean of the Graduate School, University of Georgia.

University of Georgia,
Athens, Ga.

A new Variety in Saxifraga.—The crenate to crenate-dentate leaves and the glandular-hairy pedicels of *Saxifraga virginiensis* from the eastern half of the United States make the following new variety appear very distinct.

Saxifraga virginiensis Michx. var. **subintegra** Goodman, var. nov., foliis integris vel repandis; pedicellis glabratis.

Type: *Goodman and Waterfall 4748*, McSpadden Falls, Cherokee Co., Oklahoma, May 1, 1948. (Bebb Herbarium of the University of Oklahoma).

There are ten other Oklahoma collections of *S. virginensis* in the Bebb Herbarium and all belong to the new variety. They are from Cherokee, Muskogee, and McCurtain counties.—George J. Goodman, University of Oklahoma, Norman, Oklahoma.

Notes on two adventive Plants of the Washington, D. C., Area.—Galanthus elwesii Hook., commonly called the "Larger Snowdrop", has been cultivated occasionally as an early spring garden flower in the United States over a period of many years since its discovery in Asia Minor in 1854. No record has been published heretofore, however, of its escaping from cultivation and maintaining itself successfully in the manner of a native American plant. In February 1949, I found a patch of snowdrops growing and flowering without cultivation in deep loam along the bank of a rivulet in a virgin deciduous woodland, about three quarters of a mile directly north of the District of Columbia. In 1950 the same plants were found in flower on March 5, immediately following the coldest period of the winter when the Weather Bureau reported a temperature of 15 degrees. The

area occupied by the plants approximates 60 or 70 square feet, and contains several hundred individuals. Obviously, they have been established in the location for a good many years. There are no homes or gardens in the immediate vicinity, and apparently nobody was aware of the presence of the plants before my discovery of them. Specimens deposited in the U. S. National Herbarium.

RANUNCULUS FICARIA L., a native of Europe, is a plant rather rare in American botanical collections, though it has long been listed as occurring occasionally along the eastern seaboard from Massachusetts to the District of Columbia. Britton and Brown's Illustrated Flora, 1913, states that it flowers in April and May, and Hitchcock and Standley's Flora of D. C. and Vicinity, 1919, reported the same months for its flowering. There are no earlier dates on any specimens collected in the United States and deposited in the National Herbarium, but among the specimens from Europe is one collected in flower in Spain on January 19, 1894. I have found ficaria flowering in boggy soil near Forest Glen, in Montgomery County, Maryland, from late January into March and April, through periods when the temperature, officially recorded by the Weather Bureau, descended as low as 17 degrees below freezing. My observations cover 1949 and 1950.—FRANK C. CROSS, 9413 Second Avenue, Silver Spring, Maryland.

Vol. 52, no. 618, including pages 129–164 and plate 1162, was issued 31 May, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. August, 1950. No. 620.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. **August, 1950** **No. 620**

STAMEN-NUMBERS IN CUPHEA

WILBUR H. DUNCAN

WHILE studying a collection (*W. H. Duncan* 10659, 26 October, 1949, Clayton Co., Ga.) of several plants of *Cuphea* I observed considerable variation in the number of stamens, even on a single plant. Literature immediately available to me indicated that in our United States species there is disagreement as to the number of stamens and that no detailed studies had been made on this subject. My studies of plant-material and literature were then carried farther, including a trip[1] to the Gray Herbarium, Cambridge, Massachusetts.

Cuphea is a large American genus of over 200 species. Four species occur in eastern United States, at least one more (*C. wrightii* Gray) in southwestern United States, and many species in Mexico, Central America and South America. Three of those occurring in the United States [*C. procumbens* (Cav.) Small, *C. asper* Chapm., and *C. carthagenensis* (Jacq.) MacBride] are confined to the southeastern United States. Only one species, *C. petiolata* (L.) Koehne [*Parsonsia petiolata* (L.) Rusby, *Cuphea viscosissima* Jacq., *C. viscosissima* Willd. sensu Pursh 1816], has a wide distribution in the United States (Georgia to Louisiana, Kansas and New Hampshire).

Variation from a few to many stamens occurs in the *Lythraceae* of which *Cuphea* is a member. Stamen-numbers in *Cuphea* are mostly 11 but vary from 6 to 14. In our United States species the stamens are probably 11 except for some variation in *C.*

[1] Supported by a grant through Dr. George H. Boyd, Dean of the Graduate School, University of Georgia.

petiolata. Various authors apparently disagree concerning the number in this species. Other authors do not mention the number of stamens. For example, Michaux (1803), Elliott (1821), and Robinson & Fernald (1908) give no stamen-numbers. Pursh (1816), under *C. viscosissima* Willd., says "floribus 12-andris". Torrey & Gray (1840) say "stamens 12" for this species, while Torrey (1843) gives no number but lists "Stamens about 12, unequal" for the genus. Britton (1901) indicates that there are sometimes 12 stamens in *C. petiolata*. Britton & Brown (1913) agree. Small (1933) actually uses "stamens 12" in keying out this species from the closely related *C. procumbens*, which he says has 11 stamens.

A thorough study of the genus was made by Koehne (1903). On page 85 in the Key to Sections, under Sect. 9. *Heterodon* Koehne, which includes *C. petiolata*, the stamens are listed as "11, alterne inaequalia". On the basis of a survey of the literature alone, therefore, it would appear that *C. petiolata* usually possesses 11 stamens but in some instances 12.

A brief analysis of herbarium material of *C. petiolata* yielded interesting results. Four flowers on one plant, from each of eight separate collections from seven states, were dissected and variation in size and number of stamens was recorded. The collections are from Washington Co., Tennessee; Rabun Co., Georgia; Franklin Co., Indiana; Davis Co., Iowa; Upshur and Cabell Cos., W. Va.; Allegheny Co., Pa., and Chain Bridge, Virginia. Although the stamens are uneven in size the differences are not pronounced and there are 11 stamens in each of the 32 flowers. These data certainly do not indicate that there are sometimes 12 stamens. The possibility that another species is involved was considered. This possibility is dismissed as being improbable, since all other characters agree well with those assigned to *C. petiolata* by several authors.

Four flowers from each of thirteen unmounted plants from the Clayton County, Georgia, collection were dissected and variation in size and number of stamens was recorded. The resulting data are given in TABLE 1. It may be seen that the number of stamens varies from 5 to 11, sometimes even on the same plant and that a pronounced reduction in size of some of the stamens is of frequent occurrence. Out of the 52 flowers dissected on the 13

plants 25 have 11, 10 have 10, 9 have 9, 3 have 8, 3 have 7, 1 has 6, and 1 has 5 stamens. Thus more than half of the flowers have 10 stamens or less. I shall not attempt to bring out the significance of this variation. It should, however, be emphasized that less reliance taxonomically should be placed on the number of stamens in *C. petiolata* than has been done by such authors as Pursh (1816), Torrey & Gray (1840), and Small (1933).

Plant No.	No. stamens	Notes on size of stamens
1	11–10–10–9	none
2	11–11–11–9	none
3	11–11–11–10	none
4	11–11–7–5	none
5	11–11a–10–9	(a) 3 much reduced
6	11–11–11b–9	(b) 3 much reduced
7	11–11–11–11c	(c) all 11 reduced equally
8	9–8–7–7	none
9	11–11–9–9	none
10	11–10–9d–6	(d) one, no anther; 2 fused
11	11–11–10–10	none
12	11–10–9e–8	(e) 6 much reduced
13	11f–10–10–8	(f) 2 reduced

TABLE 1. Numbers of stamens and notes on their sizes in four flowers on each of thirteen different plants in a collection of *Cuphea petiolata* from Clayton Co., Georgia.

Additional studies on stamen-numbers in *Cuphea* should be made. Although additional herbarium-material was available to me, dissections were not made because of the damage to the specimens that would have resulted from the dissection of a number of flowers on each plant. Persons collecting *Cuphea* might well keep this problem of stamen-numbers in mind and when possible collect adequate material for study. I would be happy to accept for study future United States collections that contain sufficient material for dissection-studies.

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A KEY TO THE HICKORIES NORTH OF VIRGINIA WITH NOTES ON THE TWO PIGNUTS, CARYA GLABRA AND C. OVALIS

Wayne E. Manning

There are a number of good books which are useful in the identification of hickories, such as Gray's Manual, N. L. Britton and A. Brown (Illustrated Flora of Northern States and Canada), C. S. Sargent (Manual of the Trees of North America), A. Rehder (Manual of Cultivated Trees and Shrubs), J. S. Illick (Pennsylvania Trees), C. C. Deam (Trees of Indiana), C. C. Deam (Flora of Indiana), C. H. Otis (Michigan Trees), W. M. Harlow and E. S. Harrar (Textbook of Dendrology), W. M. Harlow (Trees of Eastern U. S. and Canada), A. F. Blakeslee and C. D. Jarvis (Trees in Winter), R. J. Preston Jr. (North American Trees) and others, many of them illustrated. The winter buds are best illustrated in Illick (the enlarged drawings), Blakeslee and Jarvis, Deam (Trees of Indiana), Harlow and Harrar, Harlow, and A. O. Huntington (Studies of Trees in Winter). The best characters for separating the hickories are the mature fruit, winter terminal buds, mature leaves, and bark of the trunk; these are represented only on fruiting older trees in the fall. With these features all present it is possible to name all of the hickories quite definitely. The books mentioned above rightfully base their separations on these features, with special emphasis on fruit. The best modern treatments or keys for *Carya*, with the latest names for the species, are in Sargent, Deam, Harlow and Harrar, Harlow, and Preston. The descriptions and illustrations of *C. glabra* and *C. microcarpa* in Otis both apply to *C. ovalis*, but the twigs should not be described as hairy. *C. ovalis* is not recognized by Illick. The names of 3 species of the region covered in this article have

been changed since the time of Gray's Manual, 7th edition: *C. microcarpa* is now *C. ovalis; C. alba* is now *C. tomentosa* Nutt., and *C. glabra* var. *villosa* is now *C. pallida* (Ashe) Engler and Graebn. for most of the eastern trees [though in part *C. glabra* var. *hirsuta* (Ashe) Ashe and *C. ovalis* var. *mollis* Ashe] and *C. texana* Buckl. with its var. *villosa* (Sarg.) Little for the western members.

The writer has found that few of the keys in the books mentioned above are of much use for summer identification or for herbarium specimens. The key given below is intended primarily for this purpose and consequently emphasizes vegetative features; other features are, however, added, so these may be used where present. The principal contributions of the key are the emphasis on bud-scale-scars in *Carya cordiformis*, and that on the tufts of hairs on the serrations in *C. ovata;* an attempt is also made to show the difference in hairiness between different species. Only a few of the varieties of the species are treated, these being primarily the ones based on vegetative features. To simplify the key, the southern and western species of the Gray's Manual range are not included, namely *C. illinoensis, C. aquatica,* and *C. texana* Buckl. (*C. Buckleyi* Durand, the western representative of *C. glabra* var. *villosa* of Gray's Manual, 7th ed.). Consequently this key covers primarily the region from Ohio and Michigan to New Jersey and Maine.

The range of variation in features in each species of *Carya* is well known. This applies to the number of leaflets, the stoutness of the twigs, the hairiness of leaves and twigs, and size of fruit, so that all of these features must be used with care. The difference in stoutness of twigs and in size of terminal buds varies tremendously in the same tree from strong terminal twigs to short lateral twigs; unfortunately most herbarium specimens are made from the latter. In all species treated here individual trees may be found with seven leaflets. The writer has found of little value the relative size of the terminal leaflet or upper leaflets with respect to the lower ones, and the presence or absence of serrations at the base of terminal leaflet (the latter used in some books for *C. tomentosa*).

Certain notes are necessary. The pseudoterminal bud, which is a lateral one appearing as a terminal one especially on fruiting

shoots, must not be confused with a true terminal bud, as it differs both in size and in type of outer bud-scales. On these fruiting twigs, the scar of the fruiting tip of the twig can be found on the side of the bud opposite the uppermost leaf-scar. In all of the species of the section Eucarya (all species in the region covered except *C. cordiformis*) there are present on the true terminal bud outer dark brown coriaceous slender-tipped scales in summer, so during this season the terminal bud is not distinctive for a given species; the terminal bud is, however, elliptical, more elongate and comparatively slender in *C. ovata* and *C. laciniosa*, and subglobose to oval in the other species; there is some uncertainty, however, about the shape of the bud in *C. glabra*. These outer bud-scales fall off in late autumn or early winter in all species except *C. ovata* and *C. laciniosa*, exposing the silky inner scales or sometimes the blunt inner coriaceous scales (*C. glabra?*). At this time the terminal bud on a strong shoot is one of the best features in the genus.

The tufts of hairs on the leaflet-serrations, which the writer finds one of the best characters in *C. ovata*, varies from spring to fall in the same tree, and differs in younger trees from that in older trees, and varies from tree to tree in conspicuousness. The tufts on a typical tree during the summer are quite striking, there being a dense tuft of hairs on one or both sides of the apex of the serration, frequently arising from a slight indentation or pit along the margin of the serration. In the spring the margin of the serration is densely ciliate, with fascicled or solitary hairs, so that the tuft is not distinct as such, but the hairs are much more crowded near the apex, so it is evident that a tuft is there. The ciliation below the tuft gradually or rapidly disappears during the season. By fall many of the tufts themselves have, of course, worn off; it is, therefore, necessary sometimes to examine a large number of serrations to locate a characteristic tuft; since, however, these do not occur in other species, one such tuft is sufficient to identify the species. In the field the writer has always found some or all of the leaves of a tree with characteristic tufts; in herbarium specimens some tufts are usually present, but in examining a very large number of specimens the writer has found a few specimens, presumably *C. ovata* because of typical buds or fruits, in which tufts were not located; it is probable that some

other leaves on the tree may have had tufts, but this requires further study. On a very young tree, or sometimes on weakly developed short branches from the main trunk, the serrations may be uniformly ciliate, the hairs scattered as in other species. There is, thus, some possible source of error under the conditions indicated, especially in poorly collected specimens.

The term fascicle of hairs (or fascicled hairs), used by Sargent and others, is adopted in place of the term cluster of hairs or a stellate hair for the group of four to six hairs arising from one point, so characteristic of the leaves for many species of *Juglans* and *Carya;* in some books leaves with fascicled hairs are described as tomentose. The fascicle probably arises from one cell of the epidermis, so morphologically this might be considered a branched hair, rather than a cluster of hairs, but the appearance is definite. These hairs are one-celled and pointed, as are also the paired ones and most solitary ones in *Carya.* Gland-tipped solitary hairs, common in *Juglans*, are scarce and not characteristic of mature foliage in *Carya*, though short ones are sometimes present on very young foliage; these hairs have cross-walls and are thus several-celled. In the Juglandaceae the lower surfaces of the leaflets are glandular-scaly or lepidote because of the few to numerous sessile flat round glands or scales; leaves with only this covering are considered glabrous, as these are not true hairs.

Most of the species of *Carya* in the northeast are fairly constant and relatively easy to identify with good material, except for the two pignuts. To be sure, many of the specimens in the principal herbaria are incorrectly named, and the writer himself had difficulty in separating *C. ovata* from *C. ovalis* and *C. glabra* until he started using the tufts of hairs on the serrations on the leaflets in the first species. The teeth of *C. ovata* are usually dentate-serrate, those of *C. ovalis* and *C. glabra* are usually serrate or even incurved-serrate; this difference is not too definite, and not always constant and hence is not given in the key.

The two pignuts, *C. ovalis* and *C. glabra*, are the most difficult of all species in the northeast to separate. The writer has been unable to separate these except with completely mature fruit collected in November. Furthermore many trees have fruit intermediate between the species in various ways. It is possible that these two constitute but one variable species, an interpreta-

tion which was held in the United States about 50 years ago and which is still held by some good modern botanists; the differences might then be considered at least in part ecological. But the extremes are so definite that it seems to the writer best to consider them as two separate species, which are so recently evolved that hybrids between the two are very common. It is significant that the hickories of many hillsides and upland pastures are essentially pure stands of typical *C. ovalis*, but where one to several trees of *C. glabra* are found with *C. ovalis*, then intermediates (hybrids) are frequent. The writer has seen a number of both types of localities. In the writer's experience *C. ovalis* is more common on dry exposed upland hillsides, *C. glabra* more frequent in the valleys along streams or on less exposed hillsides, but both species may occur in both habitats. It is possible that if enough typical trees of both species are studied, excluding the intermediates, other features of bud and leaf may be found. Herbarium specimens lacking fruit, then, cannot be named definitely, though the features of leaf and bud given in the key are sometimes distinctive.

With reference to the hairy-leaved trees of the pignuts the same relative statements may be made. The pure stands of *C. ovalis*, however, seem to have completely glabrous leaves (possibly some tufts of hairs in the axils of side veins along the midribs of the leaflets), and hairy-leaved trees seem to appear only where *C. glabra* occurs alone (no such location definitely seen by the writer) or where *C. glabra* and *C. ovalis* occur together. This has led the writer to believe that *C. glabra* is the more commonly hairy of the two species, and he has now decided to adopt the name *C. glabra* var. *hirsuta* (Ashe) Ashe, not *C. ovalis* var. *hirsuta* (Ashe) Sargent, the latter name based on the same original *Hicoria glabra* var. *hirsuta* Ashe. Ashe, in his description of *H. glabra hirsuta*, var. *nov.*, in, Notes on Hickories 1896, described only the leaves, the full description reading: "Leaflets thicker; petioles and lower surface of leaves tomentose. North Carolina to Alabama." He did not describe the fruit specifically, but his name, combined with the facts that he recognized *C. odorata* (now *C. ovalis*) and its var. *villosa*, and that the trees with characteristic fruit of *C. glabra* are common in the mountains of North Carolina as illustrated by collections by Harbison at the Arnold Arboretum, indicate that

the original name of Ashe should stand. Sargent, in Botanical Gazette, vol. **66**, 1918, p. 247, states that the fruit is pyriform, usually narrowed below into a short stipitate base, usually opening only to the middle, but considers this a variety of *C. ovalis* because of the scaly bark. Ashe's original description of the tree seems not to mention the bark, as his description is separated (with that of *H. pallida*) by a blank line from the descriptions of the scaly-barked hickories (*H. ovata*, *H. carolina-septentronalis*, *H. borealis*, *H. odorata* and its var. *villosa*). Harbison has few notes on the bark on the herbarium labels, though on his no. 3 from Highlands, N. C. he indicates bark flaky with narrow thick plate-like scales. Furthermore, many of the trees in the northeast observed by the writer do not have scaly bark, even on those trees whose fruit is intermediate between that of *C. glabra* and that of *C. ovalis*. Unfortunately, there is no type of *H. glabra hirsuta* in the Ashe herbarium at the University of North Carolina; the writer is not at present ready to designate a lectotype. Harbison's collections from North Carolina and Georgia at the Arnold Arboretum, some of these referred to by Sargent in his article in Botanical Gazette mentioned above, are quite diverse in fruit. Horsey 2062, from Gallipolis, Gallia Co., Ohio, at Arnold Arboretum, has a typical fruit of *C. glabra* with essentially indehiscent husk. The writer is including in the variety all hairy-leaved trees of *Carya glabra*, including those specimens with hairy rachises, those whose leaflets are hairy on the lower surfaces, and those with hairs on both locations (this does not include specimens with hairs only in the axils of the side veins along the midribs of the leaflets). The amount of hairiness varies from tree to tree, or it is sometimes greater on the leaves of the lower branches of a tree than on its higher branches; sometimes the type of hairiness varies, the hairs on the rachis ranging from very minutely puberulent to clearly pubescent, in rare cases the hairs being in fascicles on the rachis as in *C. tomentosa*. In general, as stated in a previous article (RHODORA, vol. **47**, 1945, pp. 46–47) and in the key below, the two hairy pignuts are separated from *C. tomentosa* and *C. pallida* by their having the hairs densely crowded on the rachis, with both solitary and fascicled hairs, instead of having evident separated fascicles of curly hairs. Frequently the hairs are restricted to the rachis just below the attachment of the upper three leaflets.

For the hairy-leaved trees of *Carya ovalis* the writer is now adopting the name of *C. ovalis* var. *mollis* Ashe (Rhodora **25:** 180, 1923). Unfortunately again the writer has found no type for this variety, described from dry crests of ridges, Twin Creeks, Adams County, in southwestern Ohio, and must base the variety on the description alone ("Having the fruit of the type and with its red petioles and large leaflets, but the leaflets soft pubescent beneath"). The writer has studied few Ohio collections and has seen few hairy pignuts from that state. The writer is not yet ready to select a lectotype. The following specimens, collected by the writer and located in the herbarium of the writer at Bucknell University, have hairy rachises or leaflets and have fruit 3–4-ridged to base, close to characteristic *C. ovalis:* trees marked f, i, B, G, H, Meeting House Hill, Winchester, N. H.; trees marked G, Z, Burt Pitt Road, Northampton, Mass.; tree no. 2, North Farms, N. of Florence (Northampton) Mass.; bank of Paradise pond, opposite Burton Hall, Smith College, Northampton, Mass. On some of the specimens the hairs on the lower surface of the leaflets are mostly in fascicles as in *C. tomentosa,* and this might suggest a hybrid origin for the tree. In many localities observed by the writer, however, where the hairy pignuts are found, *C. tomentosa* is absent in the vicinity; there is, furthermore, no indication of a hybrid origin in the twig, bud, bark, leaflet-size, fruit-size, husk-type, or nut. As in *C. glabra* var. *hirsuta,* the hairs of *C. ovalis* var. *mollis,* as interpreted by the writer, may occur on the lower surface of the leaflets, on the rachis, or on both areas.

Trees with fruit intermediate between *C. glabra* var. *hirsuta* and *C. ovalis* var. *mollis* are almost as frequent as the characteristic trees; these the writer considers as natural hybrids, but is not proposing a name. In addition to these confusing trees, true hybrids between *C. glabra* or *C. ovalis* and *C. tomentosa* do undoubtedly occur.

The writer regrets that it seems necessary to break up the hairy pignuts into varieties under two different species as given above, as this means that it will be impossible to name sterile material, and difficult to clearly name many fruiting specimens.

Harlow and Harrar (Textbook of Dendrology, 1941, pp. 276–279) and others have recently questioned the range of *Carya*

ovalis and of *C. glabra* in New England. The writer has examined material collected by himself and specimens at Gray Herbarium and at Arnold Arboretum and has located characteristic fruiting specimens of *C. ovalis* in at least ten counties of Massachusetts and in at least two counties in southern New Hampshire. He has not checked the records for Vermont reported by Blakeslee and Jarvis (New England Trees in Winter) and others, and there is some uncertainty about the species represented. *C. glabra*, although scattered through much of Massachusetts, is very much less common both in this state and in most of New England, and is frequently represented by hybrids with *C. ovalis*, so that a sterile specimen of a pignut in New England is likely to be *C. ovalis*. This is also the opinion of Ernest J. Palmer, formerly of Arnold Arboretum, and one of the foremost students of *Carya*.

As indicated by the writer in RHODORA, Vol. **47**, 1945, pp. 46–47, the two hairy pignuts (there treated as one, *Carya ovalis* var. *hirsuta*) range from southern New Hamsphire and central Massachusetts through New York, Ohio, Pennsylvania, New Jersey, Kentucky, south through the Allegheny Mountains to North Carolina. The writer has seen perhaps 125 sheets of hairy pignuts, many of these sterile, many with fruit intermediate between the two species; the specimens studied were largely in the herbaria of Arnold Arboretum, University of Pennsylvania, and the writer. Detailed distribution of each species, with citation of specimens, is impossible at present until more fruiting material is collected.

It might be of value to summarize, independent of the key, the principal vegetative features which the writer finds most useful for recognizing each species in the herbarium and in the field. Brief notes on the three species omitted in the key from the Gray's Manual region are added.

C. CORDIFORMIS, 7–11 leaflets; bright yellow bud; separated bud-scale-scars.

C. OVATA, usually 5 leaflets, special tuft of hairs on the serrations; outer bud-scales of terminal bud persistent.

C. TOMENTOSA, 7–9 leaflets; separate curly fascicles of hairs on lower surfaces of leaflets, on rachis, and frequently on twig; outer terminal bud-scales deciduous.

C. LACINIOSA, 7–9 leaflets; twig tan-colored; hairs present on

lower surface of leaflets and frequently on twig; outer bud-scales persistent.

C. PALLIDA, leaflets 7–9; scattered fascicles of curly hairs present on some of rachises and also on midribs of leaflets beneath, but absent on lower surface of leaflet proper (contrary to statement in Sargent's Manual); pale glands common on lower surface of leaflets, especially in the spring; twigs in our region not hairy.

C. GLABRA and C. OVALIS together, leaflets 5 or 5–7; no special subapical tufts of hairs on serrations; rachis glabrous or if hairy the hairs crowded, not clearly in fascicles; lower surface of leaflets glabrous or sometimes hairy; twigs not hairy; glands on lower surface of leaflets small and dark, though variable; outer bud-scales of terminal buds deciduous in late fall so buds gray-silky or sometimes covered by dark blunt scales.

C. ILLINOENSIS, similar to *C. cordiformis*, but leaflets mostly 11–13, strongly falcate as opposed to rarely falcate; buds rarely bright yellow, at least the terminal strongly hairy as opposed to glabrate; upper leaflet and sometimes lateral ones stalked, not sessile (terminal leaflet in *C. cordiformis* rarely short-stalked), serrations usually prominent; venation of leaflets much as in *C. cordiformis*, the side veins not crowded, branching rather freely near the tips, the branches usually curving downward and usually going directly to the center of the serration.

C. AQUATICA, similar to *C. illinoensis*, but with mostly 11 leaflets, strongly falcate, usually narrow, the terminal stalked; serrations usually very inconspicuous; side veins of leaflets usually crowded (usually about 30 pairs in total), about one to a tooth, rarely branching at the tips, many of them ending at the sinus.

C. TEXANA Buckl. (*C. Buckleyi* Durand), similar to *C. pallida* or *C. ovalis*, with 5–9 leaflets, rachis and twig sometimes fascicled-hairy, the leaflets with numerous red scales in the spring.

1. Bud-scales valvate, the one to three pairs of bud-scale-scars comparatively high and separated; stalk of the bud forming a collar at the base of the new growth of lateral shoots, these often pseudoterminal; buds yellow, rather flattened; bud-scales not accrescent or but slightly so; leaflets commonly lanceolate or oblong-lanceolate, sometimes falcate, 7–11, never 5 only; some or all of clusters of staminate catkins on short, special, essentially leafless side shoots on old wood; nut very thin-shelled, the primary septa and usually the internal secondary ribs of the nut-shell with dark brown powder-filled cavities (lacunae); seed very bitter, with ruminating endosperm; (serrations without tufts; bark not exfoliating; husk thin, splitting only ½ way to base)..*C. cordiformis.*

1. Bud-scales imbricate, their several to many scars consisting of very many confluent lines forming a definite, usually ciliate, ring of bud-scale-scars; bud-stalk collar usually absent; mature buds brown or gray, though bud-scales often with scattered yellow glands; bud-scales strongly accrescent in spring; leaflets 5–9, lanceolate to obovate, not falcate; staminate catkins only at the base of elongate leafy shoots, these terminal and sometimes also lateral; nut rather thick-shelled,

without dark powder-filled cavities in septa or secondary ribs; seed sweet or essentially so; (bark and husk various).

2. Margins of leaflets strongly ciliate when young, each serration with a persistent dense tuft of hairs on one or both sides of the tooth just below its apex, many of the tufts wearing off on some of the leaflets by autumn; leaflets typically 5 only (trees with 7 leaflets extremely rare); (branchlets reddish-brown or olive, usually stout; this year's twig usually pubescent; terminal bud elongate, 10–27 mm. long, the outer dark brown coriaceous bud-scales persistent, the outermost usually hirsute with narrow tips; bark shaggy, the loose pieces typically long and broad; husk thick, splitting to base, hence ovary 4-ridged to base; nut strongly angled)....3

3. Mature twigs, petioles, rachises, lower surfaces of mature leaflets lightly pubescent to glabrate; hairs on leaflets mostly solitary or in pairs....*C. ovata* and varieties *Nuttallii, fraxinifolia, borealis, complanata, ellipsoidalis*

3. Mature twigs, petioles, rachises, and often lower surfaces of mature leaflets strongly villous; hairs of leaflets commonly in fascicles, though mixed with other types.....C. *ovata* var. *pubescens*

2. Margins of leaflets sometimes ciliate when young with fascicles of hairs, but serrations without special dense subapical tufts of hairs; leaflets 5–9; leaflets and rachises of those species having only 5 leaflets typically glabrate, the margins not ciliate, the twigs rather slender and glabrous, and the outer bud-scales deciduous in autumn; (bark, husk, and ovary various)....4.

4. Branchlets slender; surface and side veins of lower sides of leaflets typically glabrous (sometimes hairy in the infrequent *C. glabra* var. *hirsuta* and *C. ovalis* var. *mollis*); terminal bud short, 5–12 mm. long; twigs of the year glabrous, the branchlet or twig in autumn reddish- or chestnut-brown; leaflets 5 alone on some trees of two species, 5–9 in others, the margins commonly glabrous or glabrate; husk thin, 1–4.5 mm. thick; nuts usually not strongly angled; (leaves small to medium, mostly 6–14 inches long; mature outer dark brown coriaceous bud-scales early deciduous)

5. Rachises of some or all of leaves shaggy with definite separated fascicles of often curly hairs, sometimes becoming glabrate; leaflets 7–9, usually narrow, pale beneath, usually glabrous except sometimes on the midribs, densely glandular-dotted beneath when young with pale glands, some of these often persisting; buds and tips of twigs with few to many prominent light yellow glands; husk 3–4.5 mm. thick; (bark ridged; husk splitting to base along at least 2 sutures; S. N. J. to Ala.)....*C. pallida* (*C. glabra* var. *villosa* of Grays Manual 7th ed. in part)

5. Rachises varying from glabrous (the common condition) to densely pubescent (in the latter case the hairs usually solitary or in pairs, or sometimes in fascicles mixed with other types, not curly); leaflets 5–7, glabrous or sometimes hairy, not pale beneath, with scattered small glands; husk 1–3 mm. thick....6.

6. Mature husk warty, dull, light brown, splitting to base along 3–4 sutures, hence ovarian ridges, sometimes obscure, reaching to base

of ovary; stipe rarely present; leaflets commonly 7, or 5 and 7, or on some trees 5 only, typically ovate to obovate, or oblanceolate, thick, petiole frequently red; buds ovate, typically blunt or merely acute, the tips of the narrow outer deciduous bud-scales frequently villous; bark of trunk scaly or even shaggy, or scaly only in younger portions and ridged at base or on some trees without scaliness; nut shell thin, frequently angled above....7.

7. Rachis, petiole, lower leaflet surfaces glabrous or essentially so..... .....*C. ovalis* vars. *typica*, *obcordata*, *obovalis*, and *odorata*

7. Rachis, and often petiole and lower surface of leaflets densely pubescent (fruit sometimes with a stipe, and splitting along only 3 sutures)..... .....*C. ovalis* var. *mollis*

6. Mature husk smooth, shining, dark brown, splitting only at apex or to middle or sometimes later along one suture to base; stipe often present so fruit pear-shaped, typically strongly flattened; leaflets commonly 5, rarely 5 and 7, commonly lanceolate, thin; terminal buds usually lanceolate, acuminate, some of the blunt coriaceous glabrate bud-scales frequently persistent in winter; bark tight, ridged below, not scaly; nut not ridged, comparatively thick-shelled....8.

8. Rachis, petiole, lower leaflet surfaces glabrous or essentially so..... .....*C. glabra* and var. *megacarpa*

8. Rachis, and often petiole and lower surface of leaflets densely pubescent.... .....*C. glabra* var. *hirsuta*

4. Branchlets stout; lower surface of leaflets densely pubescent, most of the hairs in fascicles; mature terminal bud elongate, 10–27 mm. long; twigs of the year hairy, at least early in the season, or else branchlet or twig in autumn light orange or buff; leaflets 7–9, never 5 alone, the margins commonly ciliate, especially early in the season; husk medium to thick, (4) 5–10 mm. thick; nuts strongly angled at least above; fruit and nuts large; (leaves medium to large, 8–22 inches long, the petioles usually stout; outer bud-scales deciduous or persistent; husk splitting to base or nearly so; the sutures of the immature fruit often obscured by hairs)....9.

9. Twigs or branchlets tan, buff, or pale orange (but gray on one side); hairs on rachis usually not clearly in fascicles, commonly straight, the rachis often nearly glabrous; bark shaggy; outer bark brown coriaceous bud-scales of terminal bud persistent; petioles often persistent in winter; husk very thick (Cent. N. Y. & S. E. Pa. W. & S.)..... .....*C. laciniosa*

9. Twigs reddish brown; hairs on rachis clearly in separated fascicles, curly (shaggy); bark deeply

ridged, not shaggy; outer dark bud-scales of terminal bud early deciduous, so winter buds light grayish-brown, silky-tomentose; husk medium thick; Mass. South and West *C. tomentosa* and var. *ficoides*, etc.

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THE HYBRID OF LYSIMACHIA TERRESTRIS AND L. THYRSIFLORA

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× LYSIMACHIA **commixta,** NOM. NOV. *L. terrestris* × *thyrsiflora* Fernald & Wiegand in RHODORA, xii. 141 (1910); Marie-Victorin, Fl. Laurent. 145 (1935).

This hybrid, described in 1910, is so abundant and constant in the northeastern area of the range in North America of *Lysimachia thyrsiflora* L. that it is quite as deserving of a binomial by which it can be referred to as is the mostly more southern × *L. producta* (Gray) Fernald. At its various stations it usually (or perhaps always) forms very extensive colonies exactly combining the characters of the two parents and in some cases not associated with either or both of them, just as is the case of × *L. producta*. The following collections are before me:

QUEBEC: environs d'Ottawa, Juillet 7, 1915, *Victorin;* Chateauguay, 1916, *Victorin;* grande colonie, Iles de Boucherville, Co. de Chambly, *Victorin & Rolland,* no. 43,148 and 44,155; Saint-Pierre-les-Becquets, Co. de Nicolet, *Victorin, Rolland and Meilleur,* no. 44,121; vers le haut de la zone intercotidale, Saint-Francois, Île d'Orleans, *Victorin, Rolland and Meilleur,* no. 44,388; swale bordering salt-marsh, Bic, Rimouski Co., *Fernald & Pease,* no. 25,230.

MAGDALEN ISLANDS: dune-hollow, Brion Island, *St. John,* no. 1966.

PRINCE EDWARD ISLAND: many acres in swale near margin of North Lake, Kings Co., *Fernald, Long & St. John,* no. 7935.

MAINE: many acres in boggy river-meadow, St. Croix Junction, Calais, *Fernald,* no. 2170 (TYPE in Herb. Gray.); tidal swales along Cathance River, Bowdoinham, *Fernald & Long,* no. 14,364.

VERMONT: swamp, abundant, Alburg, July 15, 1939, *C. H. Knowlton;* Middlebury, June 22 and Sept. 25, 1880, *Brainerd* (PARATYPE); margin of Otter Creek, Weybridge, July 15, 1938, *Knowlton;* swamp, Colchester, July 13, 1932, *Knowlton.*

New York: very wet places along the Erie Canal, 2 miles east of Utica, *Haberer*, no. 1363.

Not only is × *Lysimachia commixta* a dominant plant where it occurs. It also has a strong tendency to invade tidal marshes. Victorin says in his Flore Laurentienne: "L'hybride une fois formé se multiplie végétativement par les parties souterraines et peut former des colonies". It would be instructive if those situated to do so would follow the subterranean rhizomes and stolons to determine to what extent they are actually connected. The herbarium-material at hand shows no more subterranean development than in the two parent-species, one of which, *L. terrestris*, is often reproduced vegetatively (by axillary bulblets). In fact, it is the observation of many field-botanists that large areas of floriferous *L. terrestris* will contain no bulblet-bearing plants and, reciprocally, that all or essentially all plants of other areas will be flowerless, but with abundant vegetative bulblets. In the herbarium of the New England Botanical Club 245 plants have inflorescences but no bulblets, 33 have bulblets but no inflorescences, and 9 (all in ripe fruit) have both, the bulblets produced long after the flowering period.

It is, therefore, a striking fact that none of the hybrids of *Lysimachia terrestris* nor of the species with which it has so successfully hybridized should show any suggestion of the axillary bulblets which are so characteristic of *L. terrestris* and which gave the species its name (Linnaeus, calling it *Viscum terrestre* because he mistook the moniliform bulblets to be a mistletoe parasitic on an herb). It is also a striking fact that *L. terrestris* (of § *Ephemerum*) should have produced with the utterly different and only remotely related species a blend which is dominant and usually in a habitat quite unlike that occupied by the other parent. In the case of × *L. producta*, one parent (*L. terrestris*) is a paludal plant with opposite green ascending leaves, often bushy-branching habit, terminal racemes and axillary bulblets, the other parent, *L. quadrifolia* L. (of § *Verticillatae*), a plant chiefly of dry or dryish woodland, with purplish or reddish leaves in remote horizontal or reflexed whorls along the simple axis, and few divergent flowers from the axils. In case of the aggressively spreading × *L. commixta*, the second parent is the single member of the unique circumboreal § *Naumburgia*, so

distinct in habit and floral structure as often to be treated as a separate genus. Some others of our native species of *Lysimachia* belong to § *Steironema*, a group of species which is often treated as a distinct genus. So far as we yet know *L. terrestris* has not crossed with members of this unique section.

Here is an alluring problem for some of the very modern students of evolution. Nature has already posed the problem. Field-study, reenforced by the newer techniques of the laboratory and the garden, should throw light upon it. Inability longer to use a microscope forces the writer to leave the question to others.

ADIANTUM CAPILLUS-VENERIS IN THE UNITED STATES

M. L. Fernald

As I pointed out in Gray, Man. ed. 8, 48 (1950), "Our plant has longer and more slender rhizomes than the typical European plant; the various geographic vars. are not yet worked out". At the time of writing I tried in vain to "wish" the problem upon the late C. A. Weatherby, who had so far dipped into the genus as to join Maxon in describing new species from Central and South America. Now, assembling data on the affinities of the flora of temperate eastern North America, it becomes important to have a more exact picture of the situation than seems to have prevailed.

Typical *Adiantum Capillus-Veneris* was described by Linnaeus, Sp. Pl. ii. 1096 (1753) with "*Habitat in* Europa *australi.*" The species is now considered to be semi-cosmopolitan in warm parts of the globe ("Europa occ. et austr. Africa. Asia temp.-Himalaya. Ceylon. Queensland, Polynesia. U. S. A. merid. et occ.—Columbia-Amazonas. ? Ind. Occ."—*Christensen*). In general plants of such nearly world-wide range, within the tropical and warm-temperate latitudes, are not uniform; and, certainly, when in the western interior of the United States the species extends northward to ravines of the Black Hills, it is in an area with a relatively northern flora. It there occurs, however, at Cascade Spring, "along the banks of a stream of warm water which

issued from several very large springs."[1] "In the southern foothills Fall River and Cascade Creek . . . rise in large warm springs."[2]

A survey of much material of the European *Adiantum Capillus-Veneris* shows the rhizome to be relatively thick and short, the whole rhizome measuring 1.5–5.5 cm. long and being densely covered with dark brown to blackish lanceolate or more slender scales. Except from the specimens and plates it is difficult to form a good impression of the European rhizome, European students assuming that, of course, everyone knows such details. From Linnaeus, Willdenow, Swartz, Schkuhr (who evidently thought it too well-known to illustrate), Hooker, Hooker & Baker and many others we get no idea of the rhizome. Some, such as the caustically critical (of others) James Britten, Eur. Ferns, 44 (1881), after saying "It is hardly necessary to describe at very great length so well-known and popular a fern as this", allows it "a slowly creeping caudex, which is black and scaly, about as thick as a quill"; and Rouy, Fl. France, xiv. 389 concurs, with "Rhizome rampant, densément paléacé"; Luerssen, Farnpfl. 81 (1889) does better: "Rhizom kriechend, spärlich verzweigt, . . . im Breitendurchmesser bis 4–5 mm. stark".

In the wide-ranging North American plant, occurring from Cuba and Florida across the southern United States, south into Mexico and north into southwestern Virginia, Kentucky, Missouri, South Dakota, Utah and southern California, the very slender and (when fresh) rather pale rhizome or caudex is elongate and, when not broken, shows a length of 0.5–1.5 dm., with the scales paler and fewer than in the typical European plant. Small well shows a portion of a rhizome in his Ferns Se. States, 120 (1938), and his description, p. 118, correctly says: "Rootstock horizontal, slender, creeping, with light-brown chaff." Whereas in the European plant the fronds only exceptionally reach a height of 6 dm., that is nearly the average with us. D. C. Eaton in Chapman, Fl. So. U. S. 591 (1860), discriminating between stipe and frond or lamina, said: "Fronds 1°-3° [*i. e.* 3–9.1 dm.] long"; and in his Ferns N. Am. i. 283 (1879) he said "one of Professor Harvey's fine specimens has a frond

[1] C. E. Bessey in Bot. Gaz. xxvi. 211 (1898).

[2] Arthur C. Mackintosh, *A Botanical Survey of the Black Hills of South Dakota* in Black Hills Engineer, xix. 161 (1931).

seventeen inches [5.18 dm.] long." With the stipe of about equal length, that means a total length of more than 1 m. Typical *Adiantum Capillus-Veneris* does not reach nearly that length.

The pinnules, too, show rather notable differences. In the European plant those of the sterile fronds are lobulate and deeply incised and commonly dentate, those of the fertile fronds commonly rounded above, only shallowly notched and scarcely to not at all toothed. In the American plant the pinnules are deeply cleft and lobed on both sterile and fertile fronds and in both they are sharply dentate, especially around the summit. The latter difference is rarely noted by those who treat the European and the temperate North American plants as identical. It was, however, detected by George Schneider, Bk. of Choice Ferns, i. 256 (1892), when he wrote: On the sterile fronds the "pinnules . . . deeply lobed from the circumference in the direction of the center, and the lobes again bluntly crenated (dentated) . . . and the lobes in the American form are usually denticulated (toothed), and sometimes very sharply so . . . In fertile fronds [in Europe], the teeth either disappear or are seen only on the upper part of the sides of the lobes". George Schneider detected a real difference which, although shown in carefully prepared drawings (like D. C. Eaton's) had been overlooked by his predecessors.

With several tendencies or truly significant characters separating the more widely spread plant of the United States from the typical plant of Europe, I propose to call the former

Adiantum Capillus-Veneris L., var. **protrusum,** var. nov., a var. typica recedit caudice stramineo vel brunneo elongato 0.5–1.5 dm. longo, 2–4 mm. crasso, sparse vel laxe paleaceo, paleis brunneis; frondibus (stipitibus inclusis) plerumque 0.3–1 m. longis; pinnulis laminarum sterilium fertiliumque acute dentatis.—Damp calcareous cliffs and sheltered slopes, Cuba and Florida to Texas, Mexico and southern California, north to southwestern Virginia, Kentucky, Missouri, South Dakota and Utah.

The following are characteristic:

Cuba: San Blas, Prov. Santa Clara, *Hunnewell*, no. 11,454.
Virginia: near New River, 1879, *Schriver*.
Georgia: shaded lime-sink near Flint River, Dooly Co., *Harper*, no. 1064; lime-sink at Forest Falls, Decatur Co., *Harper*, no. 1193; shaded perpendicular cliffs, bank of Chattahoochee

River, Quitman Co., *Harper*, no. 1756; perpendicular rocky bank of Samochechobee Creek, Clay Co., October 29, 1902, *R. M. Harper*, no. 1791 (TYPE in Herb. Gray).

FLORIDA: rocks on Chipola River near Marianna, *A. H. Curtiss*, no. 6805; cliffs at Aspalaga, *Chapman;* Aspalaga Bluff, along Apalachicola River, Liberty Co., *Small, De Winkeler & Mosier*, no. 11,021; limestone rocks in seepage, along the Apalachicola River on Rock Bluffs, Aspalaga region, *Correll & Kurz*, no. 5674.

KENTUCKY: Burnside, Pulaski Co., *Jas. H. Ferriss;* waterfall near Bronston, Pulaski Co., *McFarland*, no. 66.

TENNESSEE: Lookout Mt., *A. H. Curtiss*, no. 3709.

ALABAMA: dripping rocks along Tennessee River northeast of Sheffield, Colbert Co., *Harper*, no. 3277.

MISSISSIPPI: Waynesboro, Wayne Co., *Pollard*, no. 1235.

MISSOURI: bluffs, Monteer, *Bush*, no. 1126; dripping rocks, Monteer, *Bush*, no. 5339; on dripping rocks, Branson, *Bush*, no. 5372.

ARKANSAS: limestone ledges, White River, Washington Co., Nov. 3, 1877, *F. L. Harvey;* dripping ledges, limestone bluffs of White River, near Calico Rock, Izard Co., April 27, 1929, *E. J. Palmer*, no. 35,570; on seepage, above Buffalo, Newton Co., *D. M. Moore*, no. 32,441.

(LOUISIANA: very doubtful; see explanation below.)

SOUTH DAKOTA: border of Cascade Creek, Aug. 25, *Bessey & Clements;* wet bank of brook, Cascade Spring, Fall River Co., *E. J. Palmer*, no. 37,464.

OKLAHOMA: on bank about a spring at head of canyon, 7 mi. ne. of Guthrie, Logan Co., *G. W. Stevens*, no. 3265.

TEXAS: S. Felipe de Austin, *Drummond*, no. 355; shaded limestone cliff, McKittrick Canyon, Culbertson Co., *Moore & Steyermark*, no. 3548; North Llano River, west of Roosevelt, Kimble Co., *Cory*, no. 6735.

UTAH: St. George, Washington Co., *Eggleston*, no. 14,764; seepage under ledges, ¼ mile east of Virgin, Washington Co., *Maguire*, no. 21,485; sandstone ledge near waterfall east of Auto Camp, Zion's Park, *Maguire*, no. 16,316.

ARIZONA: Lower Kanab Canyon, Colorado River, *Chas. D. Walcott;* under rocks, Ramsey Canyon, Huachuca Mts., *L. N. Gooding*, no. 731.

CALIFORNIA: on rocks, Canyon, about 1500 ft., Mt. Wilson, Los Angeles Co., *S. F. Blake*, no. 846; shaded calcareous seep, Palmer Canyon, alt. 2500 ft., San Gabriel Mts., Los Angeles Co., *L. C. Wheeler*, no. 248; Santa Barbara, Oct., 1880, *M. D. Stebbins*.

NEUVO LEON: saturated bank, Sierra Madre Oriental, alt. about 5000 ft., *C. H. & M. T. Mueller*, no. 706.

COAHUILA: Chojo Grande, 27 miles southeast of Saltillo, *Edw. Palmer*, no. 360; edge of upper canyon, Sierra de la Madera, Cañon del Agua, *C. H. Mueller*, no. 3249; cañon del Agua Grande, shade, on gypsum by water, *R. M. Stewart*, no. 3801.

TAMAULIPAS: vicinity of Victoria, alt. about 320 m., *Edw. Palmer*, no. 189; Ojo de la Agua Grande, Cerro Bamora, vicinity of El Milagro, *H. H. Bartlett*, no. 11,066.

SAN LUIS POTOSI: Rio Verde, *Edw. Palmer*, no. 35.

SONORA: Nacori, alt. 3750 ft., *C. V. Hartman*, no. 292; wet cliff, Cajón de la Higuera, near Moctezuma, *Stephen S. White*, no. 382.

In the citation of states Louisiana was left in doubt. In the Gray Herbarium there is only one specimen of *Adiantum Capillus-Veneris* from that state. This is a single fertile frond which is not of the American var. *protrusum*, but which closely matches the European plant with deeply cleft pinnules, which was described by Willdenow as *A. trifidum*, with which the Louisiana collection was identified. This sheet "EX HERB. C. H. DEMETRIO" bears in Demetrio's hand the statement: "Found only one plant among others collected by Rev. C. Niermann, Clinton, La. Collected by Rev. C. Niermann January 1893". In the Gray Herbarium there is also a portion of a manuscript (presumably sent to Gray) from the late John L. Riddell in which he specially emphasizes that "there being no limestone in the parts of Louisiana botanically explored, we have not yet met it in this state"; and in the *Catalogus Florae Ludovicianae*, AUCTORE. J. L. RIDDELL, M.D., CHEM. PROF. UNIV. LA. in New-Orl. Med. and Surg. Journ. viii. (May, 1852) Riddell listed for the state only *A. pedatum*. The Demetrio label says "only one plant". Most American collectors emphasize its local abundance on wet calcareous cliffs and shores. In view of the cultivation of various forms of the European plant it seems improbable that the "one plant" of the European variety was native in southeastern Louisiana.

In the Riddell manuscript above referred to that keen observer proposed our plant as a new but unpublished species. He sent a water-color drawing and 3 different pinnules but his efforts were unappreciated and opposite his description the late Sereno Watson wrote "*A. Capillus-Veneris*, L.!" Unfortunately the unpublished name given by Riddell cannot be taken up, especially since he had on the sheet one pinnule from the next variety

(apparently, judging from his note) from Texas. Two trivial names have been given within this variety. One was noted under *A. Capillus-Veneris* as follows: "The form **elongatum** Lemmon is an elongated form from Arizona".—Clute in Fern. Bull. xiv. 57 (1906). Just what was elongated was not explained. The other, *A. Capillus-Veneris*, forma *cristatum* Moxley in Am. Fern. Journ. ix. 27 (1919), is a very exceptional aberration "having the tips of the fronds more or less dichotomously forking and crested". Its name should not be taken up for the wide-ranging and crestless variety.

In *Adiantum Capillus-Veneris*, var. *protrusum* the fertile pinnules are obviously cleft or deeply lobed and with evident sharp dentation except where occupied by the sori. They are thin-membranaceous or almost filmy in texture and the larger ones range from 1–3 (av. 1.6) cm. broad. In the western interior of the United States and somewhat down the mountains of Mexico there is a smaller plant, with subcoriaceous or firm pinnules, "Rootstocks widely creeping, often 10–12 cm. long, covered with slender narrow pale brown scales; . . . leaflets 6–8 mm. wide, . . . mainly 3-lobed, the incisions narrow and very shallow", etc. This is *A. modestum* Underwood in Bull. Torr. Bot. Cl. xxviii. 46 (1901), "A plant related to *A. capillus-veneris* but differing from it in the smaller, less incised leaflets, their more rounded compact shape, in the fewer narrower sori, in the light-colored stalks to the leaflets, and in general habit.

"The European specimens of *A. capillus-veneris* are usually much more laciniate than the American, but in *A. modestum* the leaflets are barely trilobed with very shallow sinuses"—Underwood, *l. c.* In a large series of *A. modestum* the larger fruiting pinnules have a breadth of 5–14 (av. 8.5) mm., this about one-half the breadth in *A. Capillus-Veneris*, var. *protrusum*. Several American authors reduce it outright to the European plant, others maintain it as a species. To me the middle course, on account of numerous transitions, seems the proper treatment and I am calling it

A. Capillus-Veneris L., var. **modestum** (Underw.), stat. nov. *A. modestum* Underw. in Bull. Torr. Bot. Cl. xxviii. 46 (1901).—Colorado and Utah, south to northwestern Arkansas, Texas, New Mexico and Arizona and locally into Mexico.

The following collections well represent the plant:

COLORADO: Hot Springs, Ouray, August 4, 1894, *Jeanie I. W. Thacher.*

UTAH: St. George, alt. 2500 ft., April, 1888, *M. E. Jones;* West cliffs, crusted with alkali, St. George, *Goodding*, no. 793; wet rocks at 864 m., St. George, *Tidestrom*, no. 9250; along stream in canyon, Zion Park, Washington Co., *Maguire & Maguire*, no. 4711.

NEVADA: Las Vegas, *Goodding*, no. 2241.

ARKANSAS: wet rocks (Ordovician limestone), Sulphur Springs, Benton Co., *E. J. Palmer*, nos. 3788 and 19,060.

TEXAS: Buena Vista, about 4 mi. west of Alpine, Brewster Co., April 3, 1936, *Warnock;* wet beds of Nueces R., Pulliam, Zavalla Co., *E. J. Palmer*, no. 11,331.

NEW MEXICO: abundant on rocks and grassy points overhanging the water of North Spring River, Roswell, *F. S. Earle*, no. 261, TYPE and ISOTYPE in Herb. Gray; Piedra Pinta, 1852, without stated locality, *Chas. Wright*, no. 2123, PARATYPE, labelled *A. chilense* Kaulf.; wet places on limestone ledges, canyon east of road, foothills east of Cook's Peak, Luna Co., *McVaugh*, no. 8129; wet loam, alt. approx. 6600 ft., Kingston, Sierra Co., *O. B. Metcalf*, no. 1380.

ARIZONA: Bright Angel Trail, Grand Canyon of the Colorado, Cocomino Co., *Carl B. Wolf*, no. 3177; petrified springs, Littlefield, *Tidestrom*, no. 9238: on lime deposits below spring seepage, Monkey Spring, Jeffcott Ranch, nw. end of Canelo Hills, Santa Cruz Co., *W. S. Phillips*, no. 2873.

COAHUILA: Saltillo, common about shady springs and watercourses, *Edw. Palmer*, no. 71.[1]

CHIHUAHUA: alt. about 1300 m., vicinity of Chihuahua, *Edw. Palmer*, no. 331.

DURANGO: San Ramón, Palmer, no. 77.

COLIMA: San Marcos, *M. E. Jones*, no. 497a.

As stated, many specimens are transitional between vars. *protrusum* and *modestum*, but the firmer texture and small and barely notched fertile pinnules and its restriction chiefly to the Cordilleran region of North America shows that var. *modestum* is truly a geographic variety, not a mere ecological state. On some Mexican sheets Weatherby suggested that this may be the *A. Schaffneri* Fournier in Bull. Soc. Bot. France, xxvii. 328 (? 1880). I have seen no material of the type-no. (*Schaffner*, no.

[1] Palmer noted that "in the market it is called 'Silantrillo', to be used to assist menstruation in females". Apparently the marketmen had an inkling that it is *Capillus-Veneris*.

64), but two other Schaffner nos. before me seem to be small plants of *A. Capillus-Veneris*, var. *protrusum*. Fournier's description was rather inconclusive:

> *L'Adiantum Schaffnerii* a les pinnules de l'*A. Capillus Veneris*, mais les frondes courtes, à peine ramifiées et souvent même simplement pinnées, naissant très serrées sur un rhizome horizontal.

Several specimens were originally labeled as *A. emarginatum*, but the Pacific American plant which erroneously passed as *A. emarginatum* Hook. but which is now known as *A. Jordani* K. Müll. is quite different in its very strong veins, in its very long linear transverse (instead of short and lunate) indusia and in the larger flabellate-rotund pinnules.

In the Rocky Mountains, however, *A. Capillus-Veneris*, var. *modestum* has an exceptional form with large fertile pinnules as broad as in the more western *A. Jordani*. This is

Var. MODESTUM, forma **rimicola** (Slosson), stat. nov. *A. rimicola* Slosson in Bull. Torr. Bot. Cl. xli. 308, t. 7, fig. 1 (1914).—Larger fertile pinnules 1.5–2.4 cm. broad.—Little known but seemingly an extreme of var. *modestum*, with fertile pinnules as large as in var. *protrusum* and standing between these varieties.

SHRUBS OF MICHIGAN.—Under this self-explanatary title the Cranbrook Institute of Science has issued a very attractive and equally accurate volume,[1] the second edition, enlarged and brought to date. The work, most happily, coming from the hand of the late CECIL BILLINGTON, cannot fail to be authoritative, a most happy situation in these days of inaccurate and unsound books on trees, shrubs or other wild plants being rushed from the press. The descriptions are clear, the maps of ranges within the state of Michigan convincing and the line-drawings most helpful. Not only will all botanists of the Great Lakes area, professional or amateur, need the book. Everyone interested in the flora of the northeastern United States and southeastern Canada will want it.—M. L. F.

[1] CECIL BILLINGTON: *Shrubs of Michigan*, ed. 2, pp. vii + 339, 206 figs. Cranbrook Inst. Sci. Bloomfield Hills, Mich. $4.50. 1949.

Volume 52, no. 619, including pages 165–184, was issued 18 July, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. September, 1950. No. 621.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. September, 1950 No. 621

NOMENCLATURAL CHANGES IN BROMUS

H. Keith Wagnon

Bromus inermis Leyss. (sect. *Bromopsis* Dumort.), a native of Europe, Siberia, and China, has apparently become more widespread in North America than any one of the native species of *Bromus*. Its introduction into North America preceded the first recognition of the closely related *B. Pumpellianus* Scribn. When Shear published his "*Revision of the North American Species of Bromus Occurring North of Mexico*" in 1900, he said in his discussion under *B. Pumpellianus*, "The difficulties of separating these species [i. e. *B. inermis* and *B. Pumpellianus*] are likely to be greatly increased in the future by the rapid distribution of the cultivated forms of *B. inermis* in the region occupied by *B. Pumpellianus* and also by the probability of hybridization of the two plants".

Later, in 1942, Hultén postulated that *B. Pumpellianus* was the American counterpart of *B. inermis*, and that its varieties *arcticus* and *villosissimus*, as well as the Kamchatkan *B. ornans* Kom. were northern variations of this complex. In 1949, Elliott also felt that *B. ornans* Kom., *B. Korotkyi* Drob., *B. irkutensis* Kom., *B. vogulicus* Soczava, *B. Richardsonii* Link, and *B. sibiricus* Drob. as treated by Nevski and Sochava (1934) could be included in the complex.

At this time F. C. Elliott also outlined the North American distribution of *B. Pumpellianus* and *B. inermis*. He presented evidence to show the presence of intermediate forms, and postulated that "introgression of the two" was taking place in the range of *B. Pumpellianus*. He felt that the hybridization be-

tween the two species was largely confined to modified habitats. Artificially reproduced F_1 hybrids between the two octoploid species were found to be moderately fertile under open-pollination. Using this evidence, Elliott reasoned that recent divergence of the two species from an Asiatic center of germplasm was suggested. A migration, he believed, took place in a Pleistocene era when cool, moist conditions prevailed over a large area of North America. Elliott concluded that *B. Pumpellianus* should be reduced to a subspecies of *B. inermis*, but did not make the necessary nomenclatural changes.

I have recently completed an intensive study (unpublished) of the North America members of *Bromus*, section *Bromopsis*. During the course of this study it became evident that the morphological differences between *B. Pumpellianus* and *B. inermis* were less than those prevailing between other pairs of closely related species of *Bromopsis*. This, in addition to the many features which the two have in common (e. g. both are octoploids, both have creeping rootstocks which are wanting in most of the other species of the section, and both have a northern range of distribution), and in addition to the presence of many intermediates between the two supposed species, strengthens Elliott's contention that the two are no more than sub-specifically different. The following combinations are necessary.

BROMUS INERMIS Leyss. subsp. **inermis** (Leyss). Wagnon, stat. nov. *B. inermis* Leyss., Fl. Hal. 16. 176[1]. *Festuca inermis* DC. & Lam. Fl. Franç. **3:** 49. 1805. *Schedonorus inermis* Beauv., Ess. Agrost. 99, 177. 1812. *Festuca inermis* var. *villosa* Mert. & Koch, Deutschl. Fl. **1:** 675. 1823. *B. inermis* var. *aristatus* Schur, Enum. Pl. Transsilv. 805. 1866. *B. inopinatus* Brues, Trans. Wis. Acad. **17:** 73. 1911. *Forasaccus inermis* (Leyss.) Lunell, Am. Midl. Nat. **4:** 225. 1915. *Zerna inermis* (Leyss.) Lindm., Svensk. Fanerogamfl. 101. 1918. *B. ciliatus* subv. *denudatus* (Wieg.) Farwell, Am. Midl. Nat. **10:** 204, as to plant only. 1927. *B. inermis* forma *villosum* (Mert. & Koch) Fernald, RHODORA, **35:** 316. 1933. *B. inermis* forma *aristatus* (Schur) Fernald, RHODORA **35:** 316. 1933.

This subspecies may be readily distinguished from the following one by its glabrous blades and by the glabrous nodes which are usually 3–5 in number.

[1] No attempt has been made to search for synonymy of *B. inermis* in foreign literature; only those names found in American works are listed.

BROMUS INERMIS subsp. **Pumpellianus** (Scribn.) Wagnon, stat. nov. *B. Pumpellianus* Scribn., Bull. Torrey Bot. Club **15:** 9. 1888. TYPE: *F. Lamson-Scribner* **418**; collected in 1883 in the Belt Mountains, Montana; seen in the U. S. National Herbarium.

This subspecies is best identified by its blades which are pilose at least on the upper surface and by the pubescent nodes which are 2 or 3 in number. In North America it is represented by the two following varieties, both of which are apparently capable of hybridizing with the subsp. *inermis*.

BROMUS INERMIS var. **purpurascens** (Hook.) Wagnon, stat. nov. *B. purgans* var. *purpurascens* Hook., Fl. Bor.-Amer. **2:** 252. 1840. *B. purgans* var. *longispicata* Hook., Fl. Bor.-Amer. **2:** 252. 1840. *B. Pumpellianus* Scribn., Bull. Torrey Bot. Club **15:** 9, as to the type. 1888. *B. ciliatus* var. *coloradensis* Vasey ex Beal, Grasses N. Amer. **2:** 619. 1896. *B. Pumpellianus* var. *Tweedyi* Scribn. ex Beal, Grasses N. Amer. **2:** 622. 1896. *B. Pumpellianus* var. *melicoides* Shear, U. S. Dept. Agr., Div. Agrost. Bull. **23:** 50. 1900. *Forasaccus Pumpellianus* (Scribn.) Lunell, Am. Midl. Nat. **4:** 225. 1915. TYPE: Arctic shore, Dr. (Sir *John*) *Richardson;* seen at the Royal Botanic Gardens, Kew, England.

Distinguished from the following variety by its glabrous glumes and by the lemmas which are pubescent along the margins, on the main nerves and on the base of the back. From Colorado in the Rocky Mountains to well inside the Arctic Circle in Alaska, Yukon and Northwest Territory.

BROMUS INERMIS var. **arcticus** (Shear) Wagnon, stat. nov. *B. arcticus* Shear, in Scribn. & Merr., Contr. U. S. Nat. Herb. **13** (3): 83. 1910. *B. Pumpellianus* var. *arcticus* (Shear) A. E. Porsild, RHODORA **41:** 182. 1939. *B. Pumpellianus* var. *villosissimus* Hultén, Fl. Alaska and Yukon. Lunds Univ. Årssk. II. Sect. 2. 38: 251. 1942. TYPE: *T. A. Walpole 2036*, Sept. 9, 1901; collected in the vicinity of Port Clarence, tundra bank near buildings at Teller Reindeer Station, Seward Peninsula, Alaska; seen in the U. S. National Herbarium (No. *379157*).

This variety is readily identified by its sparsely pubescent to hirsute glumes and lemmas. Except for a single collection from Michigan, it is confined to Alaska, Yukon and the Northwest Territory.

The identity of *Bromus purgans* L. has been the subject of some controversy. Linnaeus described in the *Species Plantarum* (1753) two American species of *Bromus*, namely *B. purgans* and

B. ciliatus. The latter, though apparently not represented in the Linnaean Herbarium (Hitchcock 1908), is sufficiently well characterized by mention of the lemmas as having only the margins pilose "*petalorum marginibus* (*non dorso*) *valde pilosis*". The description of *Bromus purgans*, however, while unusually ample for the *Species Plantarum*, is applicable to at least three American species, namely *B. purgans*, *B. latiglumis* and *B. Kalmii* as currently interpreted. All three of these species may have the lemmas uniformly pubescent on the backs as well as on the margin; the original description of *B. purgans* reads: "*Glumae pilis brevissimis undique extus villosae*".

Bromus purgans was based primarily upon material collected by Kalm in "Canada". Linnaeus doubtfully included in the synonymy of this species the "*Gramen bromoides catharticum*" of Feuillée: "*Differt nostra a Fewillaei radicibus fibrosis nec squamosis; spiculis angustioribus*". Feuillée's plant (1714) was South American in origin, and his plate appears to represent a member of the section *Ceratochloa*. Some authors have for this reason referred several plants of the section *Ceratochloa* to *B. purgans*, as pointed out by Shear (1900). It seems very clear, however, from Linnaeus' definite reference to Kalm's collection, which he described fully, that this collection must be regarded as the type of the species.

In 1907, Hitchcock (1908) visited the Linnaean Herbarium in order to study species that were based wholly or in part upon American material. He found three specimens of *Bromus*, any one of which could have been taken from material collected by Kalm, and all of which had lemmas uniformly pubescent across the backs. Photographs of these specimens were seen in the United States National Herbarium and at the Arnold Arboretum, Harvard University. I am greatly indebted to Dr. W. R. Taylor, Department of Botany, University of Michigan, who, in June, 1950, made a critical examination of the Linnaean specimens for specific characters in order to help solve this problem.

For simplicity, these specimens may best be referred to by their catalogue numbers, 93.10, 93.11, and 93.12. Specimen number 93.10 is marked (Savage 1945) "*purgans* 3 HU" in Linnaeus' handwriting, and "all 3 [sheets 10 to 12, pinned together] one sp. & *purgans* not *ciliatus* ex char. A. Gray" in Asa Gray's

handwriting. I am in complete agreement with Hitchcock in identifying this specimen as the currently interpreted *B. latiglumis* (Shear) Hitchcock, as it has overlapping sheaths with a ring of hairs at their summit. Auricles are apparently not present, as Dr. Taylor was unable to find any; once dried, these structures are easily broken off, hence their absence on old specimens does not necessarily mean that they were never present. The above-mentioned sheath-condition, and a short exsertion of the panicle are characteristic of *B. latiglumis* only. As Hitchcock pointed out, specimen 93.12 is also *B. latiglumis* as shown by overlapping sheaths, although the ring of hairs at the summit of the sheath is less conspicuous. This specimen bears the following marks- "4 HU" in Linnaeus' handwriting, and "*ciliatus*" in the handwriting of J. E. Smith.

Specimen number 93.11 is marked "4 K[alm]" in Linnaeus' handwriting and "*ciliatus*" in J. E. Smith's handwriting. Hitchcock (1908) believed this plant to be "*Bromus purgans* as commonly understood and as described in Shear's Monograph of *Bromus*, and [felt that it] should be taken as the type, in spite of the "4" placed upon the sheet by Linnaeus, probably inadvertantly". It does not have overlapping sheaths and the panicle has flexuous pedicels as was noted by Hitchcock (mss. notes in U. S. Nat. Herb.). The flexuous condition evidently convinced Hitchcock that this was the plant Linnaeus had in mind when describing the panicle of *B. purgans* as "*crispa, flexuosa, nutans*". Hitchcock may have been right in believing it was the specimen Linnaeus had in mind, but it is not a specimen of the material that has been currently referred to *Bromus purgans*. Critical examination of this specimen by Dr. Taylor revealed that it has lower leaves with boat-shaped tips, first glume 3-nerved, second glume 5-nerved, awns 2.25–2.5 mm. long and the panicle about 7 cm. long, all of which are characteristic of the currently recognized *B. Kalmii* A. Gray. Material that has currently been interpreted as *B. purgans* does not have boat-shaped leaf tips, the first glume is 1-nerved, the second glume 3-or rarely 5-nerved, the awn 4–8 mm. long and the panicle 9–25 cm. long.

In 1839 when Gray annotated specimen 93.10, he indicated that he believed it, and also specimens 93.11 and 94.12, to be *B. purgans*. However, he apparently changed his mind, because

in 1848 when he described *B. Kalmii*, he concluded his description by saying, "this is preserved in the herbarium of Linnaeus under the name of *B. ciliatus*, though it is not the plant he described; thence has arisen much confusion". The fact that Gray proposed the specific name of *Kalmii* is, in itself, also indication that Kalm collected the plant which was being described. Thus it seems evident that specimen 93.11 is the basis for *B. Kalmii* and should be designated as the type. When Shear treated this species, he said, "There seems to be no particular specimen designated as the type of this species by Dr. Gray. The sheet in the Gray Herbarium, regarded as that upon which the original description was founded, contains portions of plants from three different localities, two from New York and one from Michigan, varying however but very little from each other. These were taken as the basis of the above description".

Through the kindness of the authorities at the Gray Herbarium, I have been able to study this same sheet of specimens; aside from the fact that it was in Gray's possession at the time of the original publication of *Bromus Kalmii*, there would appear to be no reason to designate one of the plants on the sheet as the type of the species, in preference to the Kalm specimen which was specifically cited by Gray.

Linnaeus' description of *B. purgans* is apparently a composite one taken from more than one plant. The phrase "*Panicula crispa, flexuosa, nutans*", is not applicable to any one of the three specimens in the Linnaean Herbarium. The panicles of numbers 93.10 and 93.12 (both *B. latiglumis*) may be considered as "crisp" while 93.11 (type of *B. Kalmii*) only has a flexuous, nodding panicle. Thus it is apparent that the description is a mixture including *B. latiglumis* and *B. Kalmii*. However, since specimen 93.10 is labelled "*purgans* 3 HU" in Linnaeus' handwriting and the fact that *Bromus* No. 3 in the *Species Plantarum* is *B. purgans*, it seems clear that Linnaeus apparently regarded it as representative of his description. *Bromus purgans*, therefore, should be typified by specimen 93.10 and the name is thus properly applied to the material which has currently been referred to *B. latiglumis*.

Since the name *B. purgans* L. is no longer applicable to the species which has currently been so-called, another name must

be selected to take its place. The earliest valid name is apparently *Bromus pubescens* Muhl. ex Willdenow in "*Enumeratio Plantarum Horti Regii Botanici Berolinensis*" of 1809. Several spikelets from Muhlenberg's "type" specimen (No. M154) collected in Pennsylvania were seen in the U. S. National Herbarium.

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RHODODENDRON MAXIMUM IN NEW ENGLAND

Clarence H. Knowlton

It has been very interesting to bring together these New England records of *Rhododendron maximum* L. as a striking example of discontinuous distribution. The seeds of the shrub are scale-like and small and not likely to be carried far by the wind. There is some reason to assume that the shrub was once more generally distributed in New England, as is the case in the middle and southern states. Since the country was settled the beauty of the flowers has led to hacking of the shrubs, and there have been some attempts at transplanting. The Medfield, Mass. shrubs were approaching extinction when the swamp was purchased in order to protect them, and they were entirely removed from a bog in Richmond, Berkshire County, by ambitious gardeners.

It was my privilege on August 20, 1949, to visit the station for this Alleghenian shrub in Lexington, Somerset County, Maine,

guided by Messrs. Walter Deane and J. Harvey Spear of North Anson, Maine. Lexington is an unorganized township next to Kingfield, and the 45th parallel of North Latitude passes through it, halfway to the North Pole. The shrubs grow in a swampy area near Safford Pond, in rich, mainly deciduous woods. The shrub was discovered in 1845 by one Nathan Safford, who lived nearby, and the stand has spread from a few square rods to nearly two acres. About a quarter of this area is now full of dead shrubs, perhaps due to change in water-level. This region is now grown up mostly to deciduous trees, but according to old maps in 1860 and 1870 it was formerly a cleared and well-occupied farming area. The further spread of the shrubs toward Safford Pond is checked by a lusty growth of alders. The best of the shrubs are ten or twelve feet high, and they flowered well in 1949. This station was reported by F. H. Cowan in Rhodora I, 55, and has been visited by the Josselyn Botanical Society of Maine during its Kingfield meetings.

This is probably the most northern station for this shrub. From east of New England there is but one specimen in the Gray Herbarium, collected at Beaver Dam Gold Mines, Sheet Harbor, Nova Scotia.

Nearly ninety miles away in southwestern Maine, there are several stations, especially in various places near Sebago Lake. These are mostly in the town of Standish, but also at Sanford and Springvale, where three acres are covered. It has been found in South Windham, and at an isolated station in Harpswell, according to Professor Fay Hyland of the University of Maine, who has published an elaborate report on the woody plants of Maine.

In New Hampshire there are at least eight stations for this Rhododendron, from Conway south—Albany, Pittsfield, Grantham, and Strafford, and in the south at Mason, Wilton, and Fitzwilliam. The latter now belongs to the Appalachian Club, and has had splendid care and protection. The shrubs are as luxuriant as any I have seen in the North Carolina mountains, or in cultivation.

I am indebted to my friend, Mr. Waldo F. Glover, a former resident of Groton, Vermont, for information about the Rhododendrons in Caledonia County, Vt., the only section of the state

where they have been found. South of the Montpelier & Wells River Railroad in the town of Groton is Ricker Pond, and they are abundant there. North of the Railroad is the larger Groton Pond, and the shrubs flourish there on the north side. They line the brook which flows from the pond, principally on the east side. This brook is the beginning of Wells River. A mile and a half to the east is Levi Pond, where the shrubs formed a dense thicket in 1891. Some of these have died in recent years. Three or four miles from the head of Groton Pond is Martin's Pond in Peacham, on the south side of which they have held their own for years.

Norfolk County in Massachusetts seems to have been another congenial area for them. Dr. Jacob Bigelow in his Medical Botany, Vol. III, part II, page 102 (1821) says that they grow abundantly on the banks of the Charles River in Dedham, about fifteen miles from Boston, and there is an old herbarium specimen in the Gray Herbarium from Dedham, but apparently there has been no recent collection from this stand if it still exists. Also in Medfield is a station which Dr. Bigelow mentions in his Florula Bostoniensis. In recent years these plants were on the verge of extinction, when the Trustees of Public Reservations purchased the swamp to ensure their preservation. The shrubs have been slow about increasing, and none of them are very tall as yet, but there are scattered blossoms every year. There are herbarium specimens from Walpole, and from nearby Attleboro in Bristol County.

One station reported west of Norfolk County is in Blandford in Hampden County, on the plateau south of the Westfield River. Ralph Hoffman, in his Flora of Berkshire County gives an additional station at Washington (altitude 1750 feet). He also reports that some Lenox gardeners eradicated a station in Richmond, Mass., in a poorly planned horticultural venture. There is also an old specimen collected by William Oakes from Williamstown, but nothing is known of its source.

The Rhododendron has been especially at home in southern Rhode Island. Beach Pond in Exeter had a dense thicket of it in 1914. It has also been collected in the edge of an old cedar swamp in South Kingston, near Kingston Hill, in 1906, and there was an earlier collection in 1879 at Worden's Pond. Professor

W. W. Bailey, in Rhodora II, 218, speaks of its magnificent growth at Wickford and in South County.

In eastern Connecticut there are shrubs at North Stonington, not many miles from the Great Swamp region of southern Rhode Island. Further west, at Lyme, on the coast, it was collected in a deep swamp by C. A. Weatherby in 1917. Quite isolated from other New England stations is one at Union, Tolland County, almost up to the Massachusetts line, in a swamp visited by C. H. Bissell and other botanists in July, 1879.

In Litchfield County, northwestern Connecticut, it is known from Warren, also near the Massachusetts state line, and not very far from the station at Blandford, Mass. Winchester and Norfolk complete the roster for the state.

This Rhododendron apparently prefers acid soil conditions, and is completely absent from the extensive calcareous area of western Vermont. It may well have been more frequent and abundant in the past, as some of the stands have seemed to be waning, though others have spread in recent years. The beauty of the flowers has led to indiscriminate hacking of the shrubs. Experiments in transplanting have been unsuccessful.

HINGHAM, Massachusetts

THE NORTH AMERICAN VARIETY OF MILIUM EFFUSUM

M. L. FERNALD

MILIUM EFFUSUM L., var. **cisatlanticum,** var. nov., a var. typica recedit foliis glaucescentibus laminis plerumque laevibus plus minusve succulentibus 0.9–2 cm. latis apicibus vix attenuatis; panicula laxiora verticillis remotis ramis elongatis plerumque binis; spiculis 3–5 mm. longis; fructibus 2.5–3 mm. longis.—Eastern North America, from southeastern Labrador Peninsula and northwestern Newfoundland to Algoma District, Ontario, and Minnesota, south to Nova Scotia, northern and western New England, Pennsylvania, northern Maryland, West Virginia, south-central Ohio, northern Indiana and north-central Illinois. TYPE from NEWFOUNDLAND: thickets on quartzite ledges and gravel along brook, Deep Gulch, Doctor Hill, Highlands of St. John, July 30, 1929, *Fernald, Long and Fogg*, no. 1332 (TYPE in Herb. Gray.; ISOTYPE in Herb. Phil. Acad.).

Typical *Milium effusum* L., the plant of Eurasia, there has a range covering much of the vast continental area, from northernmost Scandinavia (lat. 70°) eastward to northern Kamtchatka, thence south to southern Europe, Asia Minor, the Himalaya, etc. On the other hand, the American plant which passes as identical with the Eurasian one has a very limited range, in the richest areas of eastern North America: from lat. 51° 25′ at the western entrance to the Straits of Belle Isle westward to the north shore of Lake Superior (lat. 47°) and Minnesota, thence south to Nova Scotia, northern and western New England, Pennsylvania, upland Maryland (lat. 39° 30′), West Virginia (to lat. 38° 20′), south-central Ohio (ca. 40°), northern Indiana (41° 30′) and north-central Illinois (ca. 40° 20′); *i. e.* from latitude 51° 25′ to 38° 20′, and unknown in western North America. Such a restricted range in America at once suggests doubt as to whether our plant, completely isolated, is identical with the nearly continental Eurasian species which there stretches across 160° of longitude and from lat. 70° nearly to lat. 35°.

When, therefore, one looks over a large series of specimens and the best Old World descriptions, he is at once struck by the difference in the inflorescences on the two vast continents. This habital difference in the panicle is well brought out in two readily accessible works: the Eurasian plant shown in Hegi, Ill. Fl. Mittel-Eur. i. t. 25, fig. 3; the American in Hitchcock, Man. Grasses U. S. fig. 860. Hegi's panicle is accurately described: "panicle-branches mostly up to 5 (4–7) . . . up to 1 dm. long (Rispenäste meist zu 5 (4 bis 7) . . . bis 1 dm. lang)"; Hitchcock correctly describes the panicle of our plant with "the slender branches in remote spreading or drooping pairs or fascicles". Here and in other characters their descriptions diverge and it is clear that each was describing the plant of his own area; and a study of 45 Eurasian specimens and 137 North American ones shows several nearly or quite definite distinctions in the series.

Perhaps the most striking character in the herbarium is in the branching of the panicle. Of the Eurasian Hegi (as already noted) says (and Ascherson & Graebner and others similarly say): "Rispenäste meist zu 5 (4 bis 7)", while of ours Hitchcock says: "the slender branches in remote . . . pairs or fascicles". As

early as 1843 John Torrey, in his Flora of the State of New York, 422, said "the lower branches clustered; upper ones opposite". Nevertheless, he concluded: "Our plant seems to be identical with the *M. effusum* of Europe", a conclusion which has been unchallenged for more than a century.

Returning to the contrasts, we may next note that the common Eurasian plant is described as "70 bis 100 cm hohes" (0.7–1 m.). In unfavorable conditions ours may be even lower, but Torrey said 3–6 feet (0.9–1.8 m.) and Marie-Victorin says, correctly, 0.6–2 m. high. In Europe the "Leaves are grass-green, with blades mostly (especially the basal) . . . up to 2 dm. long and 1.5 cm. broad, very rough on the margin and short-acuminate (Blätter grasgrün, mit meist (weingstens die grundständigen) . . . bis 2 dm langen und 1,5 cm breiten, am Rande sehr rauhen, kurz zugespitzten". When fresh (not well shown after drying) the leaves of our plant are glaucous, somewhat succulent or fleshy and usually quite smooth on the upper face, though scabrous on the margin. The longer ones (especially of the basal tufts, although sometimes as short as in the European, often reach a length of 3 or 4 dm. (Torrey said 8–12 inches or 1.5–3 dm.) and in the richest habitats a breadth of 1.2–2 cm. In the Old World material the margin and usually the upper surface of the leaf-blade is scabrous; with us it may be so but the upper surface is oftenest quite smooth to touch. Furthermore, a gradually acuminate tip of the blade is exceptional with us. Usually in America the lower and median leaves have almost blunt tips or these gradually rounded to the apex. In the Eurasian plant the spikelets are "about 3 mm. long" (Hegi) or "almost 3 mm. long" (Aschers. & Graebn.); in ours they range from 3–5 mm. in length. In the European plant the fruits are about 2 mm. long ("ca. 2 mm lang"—Hegi; "etwa 2 mm lang"—Aschers. & Graebn.) and oval. In our plant they are 2.5–3 mm. long and narrowly ovoid to broadly lanceolate.

With such a number of differences it is clear that the North American plant is really identical with the Eurasian; but enough of the characters break down in individual cases on both sides of the Atlantic to indicate that they are not specifically separable. In general their very similar habit, leaves, panicles and spikelets separate them both from the other recognized species of *Milium*.

The inflorescence of our plant is nearly repeated in *M. effusum*, forma *Lerchenfeldianum* (Schur) Aschers. & Graebn. with the general characters of the Old World plant but with "Rispenäste unvergweigt," in Europe; and very exceptional colonies in America superficially simulate Old World specimens. The strong departures in several characters, however, are so combined in our plants as to make their separation as a well-defined geographic variety desirable.

Representative specimens in the Gray Herbarium and in the Herbarium of the New England Botanical Club are as follows, these selected from 137 collections studied:

NEWFOUNDLAND: Highlands of St. John, *Fernald, Wiegand, Long, Gilbert and Hotchkiss,* no. 27,511; Ingornachoix Bay, *Fernald, Wiegand & Kittredge,* no. 2488.

QUEBEC: Blanc Sablon (Straits of Belle Isle), *Fernald & Wiegand,* no. 2489; Rivière des Caps, Anticosti, *Victorin & Rolland,* no. 27,813; Table-topped Mt., Gaspé Co., *Fernald & Collins,* no. 383; Mt. Albert, Gaspé Co., *Fernald & Collins,* no. 402; Cap au Renard, Gaspé Co., *Pease,* no. 19,228; Grand Cascapedia River, Bonaventure Co., *Williams, Collins & Fernald,* July 12, 1905; Cap Chat River, Matane Co., *Fernald & Pease,* no. 24,844; Bic, Rimouski Co., July 16, 1904, *Collins & Fernald;* Rivière du Loup, Temiscouata Co., *Fernald & Weatherby* in Pl. Exsicc. Gray. no. 515; Lake Ouimet, Terrebonne Co., June 18, 1922, *Pease,* no. 19,023; Bolton, Brome Co., July 25, 1926, *Knowlton.*

NEW BRUNSWICK: Clair, July 11, 1904, *A. A. Eaton;* Woodstock, *Pease,* no. 25,241.

NOVA SCOTIA: St. Paul Island, *Perry & Roscoe,* no. 46; Pleasant Bay, Inverness Co., *Pease,* no. 26,632; Five-mile River, Hants Co., *Pease & Long,* no. 19,859.

MAINE: Monticello, *Fernald & Long,* no. 12,587; Township iv, Range 18, Somerset Co., July 7, 1917, *St. John & Nichols;* Jackman, *Fernald & Pease,* no. 24,842; Day Mt., Strong, August 31, 1904, *Chamberlain & Knowlton.*

NEW HAMPSHIRE: Stewartstown, *Fernald & Pease,* no. 16,680; Colebrook, *Pease,* no. 10,384; Carroll. *Pease,* no. 30,155; Milan, *Pease,* no. 17,117; Mt. Willard, Crawford, July 1, 1898, *Williams;* Croydon, *F. C. Seymour,* no. 4732.

VERMONT: Guildhall, *Pease,* no. 23,728; Willoughby, June 24, 1892, *Kennedy;* Eden, June 9, 1918, *Knowlton;* West Monkton, June 16, 1881, *Faxon;* Cavendish, *Fernald,* no. 446.

MASSACHUSETTS: Middlefield, *Fernald & Long,* no. 8690; Mt. Greylock, North Adams, July 25, 1916, *Hoffmann;* West Stockbridge, May 30, 1920, *Hoffmann.*

CONNECTICUT: Hartland, *Weatherby*, no. 3494.

NEW YORK: Bonaparte Swamp, Lewis Co., *House*, no. 6278; Canton, *O. P. Phelps*, no. 168; Utica, *Gray*, N. Am. Gram. Cyp., no. 113; Arkville, *Agnes Chase*, Am. Grasses, no. 631; Wayland, *Wiegand*, no. 15,209; Savannah, *F. P. Metcalf*, no. 5598; Cortland, *Eames & MacDaniels*, no. 3499.

PENNSYLVANIA: Elkdale, *Fogg*, no. 12,196; Elmhurst, *Glowenke*, no. 5896; Moscow, *Glowenke*, no. 7843; Pavia, *Berkheimer*, no. 2517; Brockway, *Wahl*, no. 2287 (leaves 2 cm. broad); Morris, *Fogg*, no. 16,096.

WEST VIRGINIA: Canaan Valley, Tucker Co., *Allard*, no. 6880.

ONTARIO: Niagara, June 6, 1891, *J. Macoun;* Galt, *Montgomery*, no. 1085; Stokes Bay, *Krotkov*, no. 8703; Sault Ste. Marie, *F. J. Hermann*, no. 7261; Batchawana, Algoma Distr., *Taylor et al.*, no. 1084.

MICHIGAN: Port Huron, *C. K. Dodge*, no. 39; Tecumseh, *Folwell*, no. 99; Ann Arbor, June 8, 1898, *Burnham;* Lansing, June 7, 1886, *L. H. Bailey;* Gogebic Lake, *Pease & Bean*, no. 26,468; West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3086.

OHIO: Braceville Twp., Trumbull Co., June 9, 1907, *Webb & Rood:* Nelson Ledge, Portage Co., *Webb*, no. 923.

WISCONSIN: Granite Heights, *Cheney*, no. 3107; Mole Lake, Forest Co., *E. J. Palmer*, no. 27,747; Racine, June 21, 1881, *J. J. Davis*.

ILLINOIS: Elgin, 1863, *Vasey*.

GALIUM HARCYNICUM: A PROBLEM IN INTERPRETING THE INTERNATIONAL RULES

M. L. FERNALD

RECENT European taxonomists agree that this species of western, central and northern Europe (northwest to Iceland) and southeastern Newfoundland, which has often passed as *Galium saxatile* L. Sp. Pl. i. 106 (1753), is not that species "*Habitat* in Hispaniae *maritimis lapidosis*". Unfortunately, in first recording this "HEATH-BEDSTRAW" as a native of the rocky barrens of southeastern Newfoundland, in RHODORA, xxviii. 83 and 236 (1926), I accepted for the plant the name of Linnaeus (1753), not realizing, as recent Europeans assert, that *G. saxatile* sensu many authors, not L. (1753), should be called *G. harcynicum* Weigel, Obs. 25 (1772) or as most of them, including many who claim to follow the International Rules, insist on writing it *G. hercynicum*, the spelling which Weigel did not use.

As to the spelling of the specific name, the current European practice, starting perhaps with DC. Prodr. iv. 598 (1830), departs from Weigel's original and only spelling "*harcynicum*". Weigel, naming the species *Galium harcynicum*, cited the *Galium caule decumbente*, etc. of Haller, Hist. Stirp. Helvet., no. 717 (1768). Haller's plant grew "In sylva Hercynia", "Hercynia silva" being the classical name of the great forest extending from the Schwarzwald to the Harz Mountains. In composing his specific name *Galium harcynicum* Weigel, unhappily, gave a Germanic rather than a clssical form to it. In 1805, two of the most scholarly of botanists, Lamarck and DeCandolle, Fl. Fr. ed. 3, iv. 261 (1805) accepted, without indication of etymological protest, and described in detail as their no. 3376: "Gaillet du Hartz. *Galium Harcynicum*". At the same period other learned botanists, such as Gmelin, Fl. Baden. i. 338 (1805), unequivocally called the plant by its original binomial. It was later than that that the change to *G. hercynicum* was made. This is indicated in *Index Kewensis* where one finds the following entries under *Galium*, though with the misidentification which others had made:

> *harcynicum*, Weigel, Obs. 25, sphalm. vide = *hercynicum*.
> *hercynicum*, Weigel, l. c. 25 = saxatile.

The assertion that Weigel's perhaps unfortunate spelling was an orthographic or typographic lapse is only an assumption. So long as botanical nomenclature was what has been called a "personal-preference, hit-or-miss" matter, authors changed at will the original spellings. Now, however, we have the International Rules of Botanical Nomenclature. Article 70 says:

> The original spelling of a name or epithet must be retained, except in the case of a typographic error, or of a clearly unintentional orthographic error . . .
> Note 1. The words "original spelling" in this Article mean the spelling employed when the name was validly published . . .

Then as examples of retention of original spelling are the following: "*Mesembryanthemum* L. (1753) and *Amaranthus* L. (1753) . . . must not be altered to *Mesembrianthemum* and *Amarantus* respectively, although these latter forms are philologically preferable. *Valantia* L. (1753) and *Clutia* L. (1753), commemorating Vaillant and Cluyt respectively, must not be altered to *Vaillantia* and *Cluytia*". So far as I can see the

original specific epithet *harcynicum*, accepted by Lamarck & DeCandolle and many others as a valid name, "must not be altered to" *hercynicum*, "although" this latter form is "philologically preferable". If this case is not exactly parallel with those cited in the International Rules, as it seems to be, then the latter need clarification. If this and other "Doubtful cases should be referred to the Executive Committee", as the Rules direct, they will, judging from past experience, apparently get no consideration whatever and "personal preference" will again prevail!

As to the difference between the retention of the original spelling and the rejection of a name as originally published, the editors of the International Rules were as inconsistent as possible. Among the "Examples of unintentional orthographic errors" one finds: "*Libertia Laurencei* Hook. f. (*Fl. Tasman.* II. 34: 1860) being an orthographic error for *L. Lawrencei* Hook. f. (*l. c.* 373, t. 129), the latter spelling should be adopted: the collector's name was Lawrence, not Laurence." The original and philologically correct *Laurencei* given with the Latin description, "the spelling employed when the name was validly published", must by this interpretation be thrown out because in a list of Additions (p. 373) and in the caption of the plate it was given the philologically incorrect form *Lawrencii*. Bentham, a scholar like Hooker fil., in his Fl. Austral. vi. 414 (1873) used the original (but, by the interpretation of the International Rules, incorrect) *L. Laurencei* and Index Kewensis, iii. 76 (1894), "COMPILED . . . UNDER THE DIRECTION OF JOSEPH D. HOOKER (names there published cited as of "Hook. fil. & Jackson"), has only *L. Laurencei*. The species was "validly published" with a philologically correct name and that name was consistently used in subsequent writings of the author's intimate and scholarly associates or under his sponsorship. Therefore, by the interpretation of the editors of the International Rules, that name, which was correctly spelled (as a Latin name) in the original description must be excluded as an "unintentional orthographic error" because the plant was discovered by *Lawrence* (not *Laurence*). *Valantia* and *Clutia* (for *Vaillant* and *Cluyt*) must stand because Linnaeus incorrectly Latinized the names of those scientists! "Consistency, thou art a jewel!"

A CULINARY USE FOR THE LEAF OF VITIS RIPARIA

Herbert Habeeb

Happily, when the old-folks shook off the dust of centuries of subjugation and oppression to come to the New World, they still retained a taste for certain dishes of prepared foods, one of which entails the use of the leaf of *Vitis*. And fortunately, the leaf of *Vitis riparia* Michx. was soon found to be particularly suited for this purpose. The leaves, gathered in June at maximum size and still tender, are rolled around a mixture of ground meat and rice into cigar-like shapes with ends tucked in. The resulting cooked product, *rolled grapeleaves*, forms a deliciously tart main course with or without the application of lemon-juice.

As no mention of this use of the wild grapeleaf is found in that remarkably complete work on *Edible Wild Plants of Eastern North America* by Fernald and Kinsey, it occurred to the writer that this is worthy of a note in Rhodora. And of course the recipe of a little-known highly favored dish is hereby passed on to the readers of Rhodora and botanical friends.

The leaves are gathered fresh, and are made ready by snapping off the petioles right at the blade. For the filling use one pound of minced meat, lamb or beef, with a little suet, to one cupful of (long) rice; mix in a bowl, and salt and pepper to taste. Place about a tablespoonful of the filling in the center of the leaf, give it a roughly cylindrical shape, then fold leaf-edges over the cylinder-ends and roll loosely from the leaf-base towards the leaf-apex. Stack these rolled grapeleaves in a pot, add cold water to two-thirds of their depth, and boil gently for one hour. A plate should be placed under the rolled grapeleaves to prevent burning, if thick-walled utensils, "Wear-ever", are not at hand.

My father, who claims to have been at six years of age a cook's helper, washing dishes and setting the table for 40 Italian railroad workers on the Beirut to Damascus line, says, "people like to eat a dish like this, but they just will not cook it". But. considering the gusto with which botanists in the past have tackled strange dishes, I have no fear that this recipe will go untried.

Incidentally, if the leaves are gathered later in the season, they are rather tough. But they can be salted away in a jar with a

liberal amount of ordinary table-salt on each leaf. Placed in a cool spot in the cellar, they keep through the winter. The salting tenderizes the leaves. To use the salted leaves, wash each leaf and soak over night. The leaves also keep dried.

GRAND FALLS, New Brunswick

THE EIGHTH EDITION OF GRAY'S MANUAL OF BOTANY.[1]—Amateur and professional botanists alike have eagerly looked forward to this new edition of Gray's Manual. Forty-two years is a long time in the light of the rapid strides which all branches of botanical science have made in recent years and when botanists realized that the new edition was really on the way, it seemed that it would never actually materialize. Now that the book is before them, their long period of waiting has been richly rewarded. It might be said that this volume is more than a revision, so much that is new has been incorporated into it. In looking it over, it is borne in upon one what a prodigious amount of research was involved. This eighth edition comes off the press just two years over the hundredth anniversary of the original edition by Prof. Gray in 1848.

To this edition Prof. Fernald has given the fruits of a lifetime of study, not only in the herbarium but to a greater extent than can be said of any of the previous authors, of intensive work in the field. He has added considerably to the area covered by the seventh edition by including the Gaspé Peninsula and Newfoundland, in fact all the region south of the Straits of Belle Isle. Since the last edition there has been much careful and intensive field-work in all parts of the manual range. More than any other such manual this book represents an intimate knowledge of the plants in the field. Especially is this true of the author's own field-work. Such accurate understanding of the live plants is reflected in the writing of the descriptions in the text.

There are certain specifications which the botanist who uses such a manual has a right to expect. Two such criteria seem to be of prime importance. First the text should show the highest degree of accuracy. How well the Manual shows this, only those who have followed the author's painstaking work through the years can fully realize. The second criterion is that the Manual should be usable for both professional and amateur botanists. In looking over the book various devices to facilitate its use are at once apparent. The practice of italicizing the most distinctive characteristics has been followed as in the seventh edition. The use of various kinds of type to make the text clearer is also followed. Under the genera several categories have been used for grouping as for example subgenera, sections and series. By this means the more conservative treatment of the genera has been possible while at the same time indicating worth-while distinctions. Many of the illustrations of the older book have been retained and in addition many more figures have been used here for the first time. These are of much help in emphasizing critical structures. The glossary again appears, much expanded and in larger type to make its use easier. At first the appearance of two indices, one to Latin and the other to colloquial names, is a surprise, as in the seventh edition they had been merged in one master-index. Again this innovation may be an advantage. From the standpoint of the beginner, the absence of unfamiliar Latin terms in with the English names will probably render the book more

[1] MERRITT LYNDON FERNALD—*Gray's Manual of Botany*, Eighth (Centennial) Edition—Illustrated. A Handbook of the Flowering Plants and Ferns of the Central and Northeastern United States and Adjacent Canada. LXIV + 1632 pp. New York—American Book Company 1950. $9.50.

usable and certainly for the advanced amateur and the professional botanist, a clean Latin index is a time-saver.

The families, as they were known in the seventh edition, have been for the most part retained, as well as the order in which they occur. There has been some readjustment in accordance with the better understanding of the plants in our area and of their relationships. The inclusion of one new family, the *Butomaceae*, was made necessary by the aggressive appearance of *Butomus umbellatus* in our Flora. A few other families are new to the area. In some cases there has been a significant expansion of a group, well illustrated in the treatment of *Amelanchier* and *Antennaria*. To one familiar with the seventh edition the nomenclatural changes may seem too extensive but such alterations were necessary because of a better understanding of the types and of the original descriptions. The newer revised nomenclature and modern methods are well shown in the treatment of the genus *Carex*, a treatment which will be welcomed by all students of this group.

Such a work as this naturally contains a great number of new forms, the result in part of the enlarged area covered. This is particularly true in such genera as *Salix*, *Betula*, *Saxifraga*, *Astragalus* and *Oxytropis*. To a much greater extent this is the result of more intensive study of the old area and a more critical study of old entities. Readers of RHODORA have been aware of this reviewing of supposedly well-known genera and species and have been stimulated to a more critical attitude in their own collecting. The new Manual crystallizes this attitude and will be sure to add an increased interest in our local Flora. At the same time, plants which really do not show a tendency to establish themselves, have been excluded or only casually noted.

There are other features which will make the book more usable. The more adequate keys, in general dichotomously arranged, are such an improvement over the older book. The descriptions are more extensive and in many cases entirely rewritten and so have smoothed out many of the difficulties encountered in the older book. Pronunciation is indicated as in the previous edition. Here even the seasoned botanist may find a surprise.

Some innovations are encountered. One new feature is the adding of the meaning of each scientific name, whether genus, species or variety. In the seventh edition this was done only for the genera. This will add greatly to the interest in the study of individual plants. Scientists are not supposed to have imaginations nor are they noted for their sense of humor; but in reading of the way in which some of our plants received their names, one is again and again surprised by the strange ideas held by the early authors. Some examples will show that the study of these names may be in itself a fascinating recreation. *Dryopteris Robertiana* was not named for a person but for its supposed identity with Herb Robert. *Quercus imbricaria* (overlapping) received its specific name, not from imbricated scales of its cup, but because in Michaux' time the wood was used for shingles. The specific names of both *Digitaria Ischaemum* and *D. sanguinalis* mean Styptic, one from Greek and the other from the Latin, due to the reddish color of the plants. *Potentilla Crantzii* was so named by the author of it for himself. Even the author of the Manual has allowed himself a bit of humor in *Rubus pernagaeus* (of the land of hams, from the type-region, Smithfield, Va.). *Rhus Vernix* (varnish) was the result of a misconception of Linnaeus, who thought Asiatic lacquer was derived from this species. *Cornus* (horn) was so named because of hardness of its wood. The wood had various uses as the old English Dagwood or dagger-wood would indicate, preserved in our English Dogwood.

Also where there is a vernacular term used in Quebec, it has been indicated, in addition to the English name. Another acknowledgment of the state of present-day scholarship, is the use of Roman type for Greek roots. This feature undoubtedly will add to the usefulness of the book.

When a group has had a thorough revision in recent years, reference is given in a foot-note to the place where the fuller treatment may be found, in many cases in RHODORA. The International Rules of Botanical Nomencla-

ture have been followed so as to make the work usable to the great number of botanists all over the world.

The new work has 706 pages more than the seventh edition. Hence the book is somewhat larger than that edition. The publishers have done an excellent job in incorporating such a large increase of material in a single volume which, though large, is not clumsy. Of the entities treated in the book the Monocots and Dicots show the greatest increase. Some statistics might be interesting:

7TH ED.	GENERA		SPECIES	
	NATIVE	INTROD.	NATIVE	INTROD.
Monocots	184	26	993	92
Dicots	596	154	2280	571
Total	780	180	3273	663
8TH ED.				
Monocots	191	50	1250	165
Dicots	616	234	3029	926
Total	807	284	4279	1091

Certainly the amateur will find the present edition very usable and as free from technical difficulties as is consistent with accurate differentiation. All botanists are indebted to Prof. Fernald for the profound scholarship exhibited by the Manual and realize that he has rendered a service to science that would be hard to duplicate.—RALPH C. BEAN, Wakefield, Mass.

SCAMMAN'S FERNS AND FERN ALLIES OF NEW HAMPSHIRE.[1]—Attention

[1] SCAMMAN, EDITH. *Ferns and Fern Allies of New Hampshire.* New Hampshire Academy of Science Bull. **2**. 96, [2] p. incl. 18 pl. Durham, N. H., 1947. (Obtainable from Dr. R. L. Blickle, Durham, for $1.25.)

should be called to this excellent treatise on the pteridophytes of New Hampshire, published nearly three years ago but not yet sufficiently distributed, and practically unnoticed in the reviewing literature. It provides a carefully prepared list of 71 species and 60 infraspecific forms and hybrids known in the state, with keys to families, genera, species and varieties, and for each species brief synonymy, a paragraph or two discussing the distinctive characters, and a statement of general and local range, the latter with citation of counties or towns in the case of species that are not distributed throughout. The systematic treatment is followed by a fairly full bibliography, a glossary, a list of authors cited with full names and dates, and a full index. The excellent line drawings—those of the ferns by Dr. Shirley Gale Cross and Gordon W. Dillon, those of Equisetum and Lycopodium, as well as one plate of Dryopteris, by Mrs. Una F. Weatherby—should be very helpful in identification. An outline map of the state showing the counties and perhaps some of the principal collecting localities would have added to the utility of the work.

The only similar separate work for any New England state is Mrs. Edith B. Ogden's The Ferns of Maine (1948), which covers a more restricted field in greater detail. It includes only the ferns proper (Filicineae), gives comparatively full descriptions as well as keys, and cites all specimens examined or recorded in the literature.—S. F. Blake.

Volume 52, no. 619, including pages 185–208, was issued 2 August, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
} Associate Editors

Vol. 52. October, 1950. No. 622.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

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Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. October, 1950 No. 622

SHORTIA GALACIFOLIA FROM GEORGIA

Wilbur H. Duncan, Haskell Venard and G. W. McDowell

On 8 December, 1788, André Michaux collected *Shortia galacifolia* Torr. & Gray at the headwaters of the Keowee River (in Oconee County, South Carolina). He placed the material of this collection in his herbarium among "*plantae ignotae*", where Asa Gray found it early in 1839. From that time until the present much has been written about *Shortia*. Probably no other plant in the eastern United States has received so much attention by botanists. Its history since 1839 is well summarized by Jenkins[1] in 1942, a little more being added by Prince[2] in 1947. Up to 1949, *Shortia* had been found growing wild in McDowell, Transylvania and Macon Counties (?), North Carolina; and in Oconee County, South Carolina. On 19 March, 1949, the authors located a colony in Rabun County, Georgia, the third state and fifth county in which *Shortia* is known to grow.

Since 1939, the senior author had been looking more or less casually for *Shortia* in northeast Georgia, but without success. More recently the junior authors also became interested in the possibility of locating the plant in this same area. During the first two months of 1949 plans gradually materialized for a joint trip to search for the species. Saturday, 19 March, was chosen as the date when all could make the trip and have the most promise of locating flowering plants (A. E. Prince et al., collected flowering material in Oconee County, South Carolina, on 18 March, 1944).

[1] C. F. Jenkins, Arnoldia **2**: 13–28.
[2] A. E. Prince, Rhodora **49**: 159–161.

The weather had been unseasonably warm for some time, but on Saturday morning the roadside banks were heavy with frosted earth. As we drove out of Walhalla, South Carolina, frost could be seen on the mountains in the distance. Soon we were climbing the mountain grade north of Pine Mountain Post Office, Georgia, and before long had turned to the right on the Burrell's Ford-Glade Mountain road. Frequent stops were made to search in places that seemed the most likely to support a colony of *Shortia*.

The afternoon found us in the Reed Creek area southwest of Glade Mountain. One stop along the narrow forest-road was at at area of exceptional relief, a precipitous ravine nearly south of Glade Mountain. We were walking single-file under *Kalmia* and *Rhododendron* along the steep slopes of the ravine a short distance from the creek, when suddenly the senior author, who was leading the file at that time, saw a colony of *Shortia*. The colony was about 8 feet long and 4 feet wide. Less than twenty inches from the far end of the colony was the end of an icicle about 18 inches long. Even in spite of the cold weather, flowers could be seen here and there over the colony. Inspection showed that they were among the last of the season as there were many peduncles, each with a persistent calyx, and there were no more flower-buds. Pictures were taken and specimens collected (*Duncan* 9083, with McDowell and Venard).

It seemed that there should be other colonies but an additional search of over an hour was fruitless (On another trip in August the senior author did locate another small colony deep in the ravine over a hundred yards from the first colony). We were happy about finding *Shortia* in another state on the first trip that any of us had made with definite plans to look for it, and contrasted our good fortune with the fruitless search for the species by Asa Gray and others over a period of 40 years following 1839. The fact that previously discovered localities in adjacent South and North Carolina were of considerable assistance in directing our search did not dim our elation.

Although much has been written about the history of *S. galacifolia*, one part seems to have been neglected—that part covering the period of many thousands of years before Michaux collected it in 1788 at the headwaters of the Keowee. *S. galaci-*

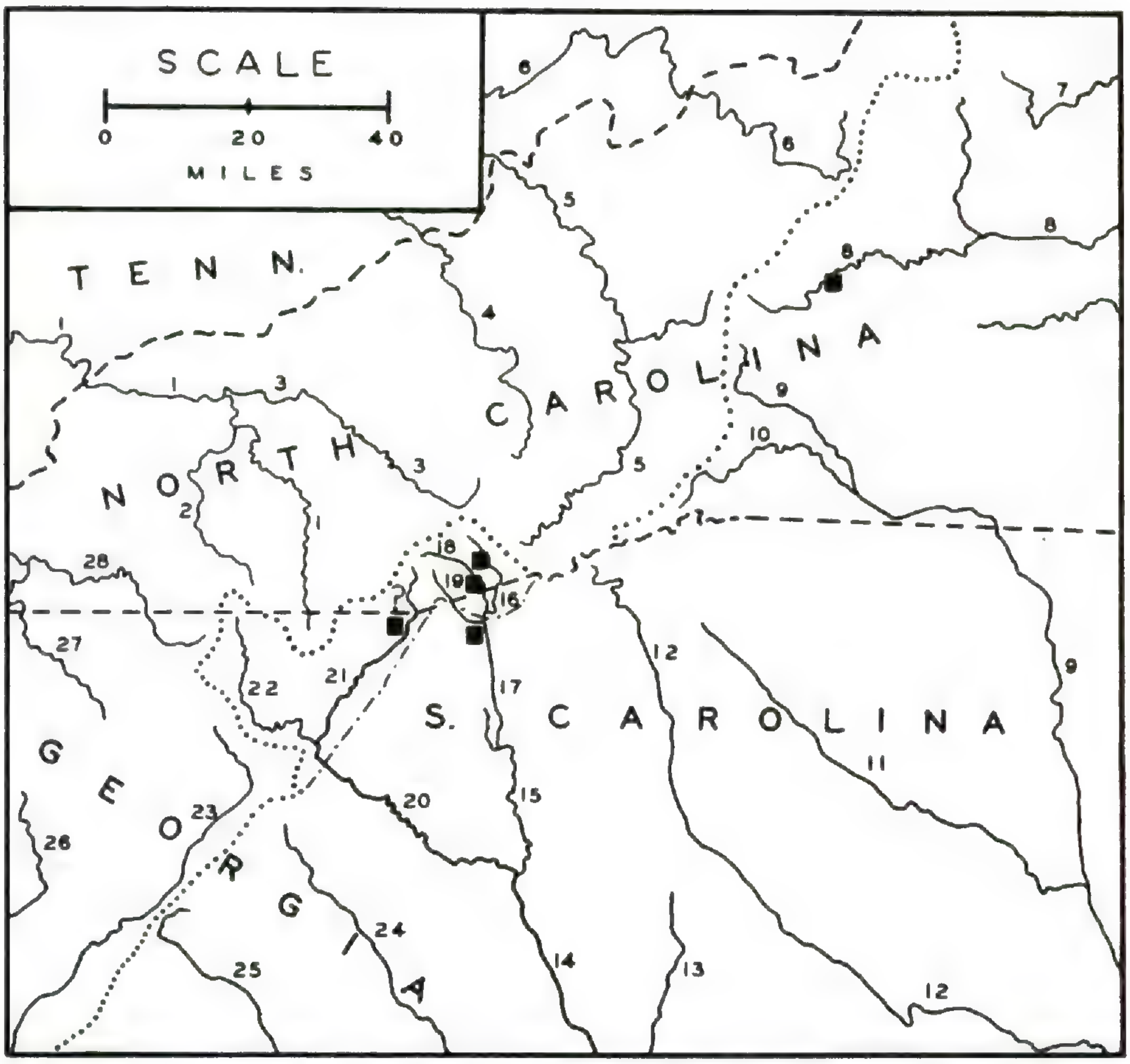
folia apparently is an old species, other members of the genus occurring in Japan, Formosa and southwestern China.[3] Undoubtedly the genus had a much wider distribution than now, having a continuous distribution from Asia to America across the Bering Strait land-bridge. This may have occurred as early as the Oligocene, an era of warm climates that would have allowed temperate plants to occupy those areas nearer the polar region. The American population of *Shortia* was likely widespread. During the later phases of this widespread distribution the eastern North American component undoubtedly was *S. galacifolia*. Ultimately the area occupied by this species was reduced, the surviving populations occurring near the heart of the area occupied earlier.

How does the present distribution of *S. galacifolia* fit into this story of abundance in older geological times and survival near the center of an earlier distribution? The accompanying map shows the present known distribution, and the location of rivers in relation to the divide separating the Atlantic Ocean and Gulf of Mexico drainage systems. None of the stations is located more than 15 miles from the divide and all are on the Atlantic side. This divide probably marks the position of the old mountain ranges that were present prior to the time of the Great Smoky Mountain overthrust that raised the area near the Tennessee-North Carolina state-line until it included the highest mountain ranges in the eastern United States. The streams, however, maintained their general drainage pattern, preserving the old divide, a reminder to us of the geologic past when the highest mountain ranges were there, perhaps at the very heart of the area occupied by *Shortia*.

The fact that *S. galacifolia* occurs solely on the Atlantic side of the divide (see map) may be of little or no purport because some of the present stations may have been in the Gulf drainage. It is generally accepted that the Chattooga and Tallulah Rivers of the Savannah River System were once a part of the Chattahoochee River System.[4] Also, drainage in the upper tributaries of the Keowee may have been reversed, flowing into the Tuckaseegee River and finally into the Gulf. It is likely, therefore, that

[3] See "Sino-Himalayan Species of *Shortia* and *Berneuxia*" by Hui-Lin Li in RHODORA 45: 333–337, 1943.

[4] N. M. Fenneman. Physiography of the Eastern United States. 714 pp. 1938.



Map 1. Portions of Tennessee, North Carolina, Georgia, and South Carolina showing localities, indicated by black squares, where *Shortia galacifolia* is known to have been collected. The question mark (?) represents a Macon County, N. C., collection which is in doubt. The present divide separating the Atlantic Ocean and the Gulf of Mexico is indicated by a dotted line. Probable location of a portion of the divide prior to major stream piracy is indicated by a line of dots alternated with dashes. Numbers are for names of rivers as follows: 1. Little Tennessee. 2. Nantahala. 3. Tuckasegee. 4. Pigeon. 5. French Broad. 6. Nolichucky. 7. Yadkin. 8. Catawba. 9. Broad. 10. Green. 11. Enoree. 12. Saluda. 13. Little. 14. Savannah. 15. Seneca. 16. Toxaway. 17. Keowee. 18. Horsepasture. 19. Whitewater. 20. Tugaloo. 21. Chattooga. 22. Tallulah. 23. Chattachoochee. 24. Broad. 25. Oconee. 26. Etowah. 27. Nottley. 28. Hiwassee.

S. galacifolia once occurred on both sides of the old divide. The possibility of its occurring at the present time on the Gulf side of the divide is good. The tributaries of the upper portion of the French Broad River or the Green River would seem to be the most promising areas in which additional stations of *Shortia* might be discovered. Botanists visiting these areas should be on the lookout for the species.

STUDIES IN THE CARYOPHYLLACEAE—IV

A Synopsis of the North American Species of the Subfamily Silenoideae[1]

Bassett Maguire

In a further review of materials in the *Caryophyllaceae*, it has become necessary to re-examine and re-assess certain complex genera with the aid of more recently collected specimens, and in the light of recent works of a number of critical students.

It is proposed here to list the categories recognized at this time, and to offer with some comment new names and arrangements that seem necessary. Adequate material and field-observations are yet insufficient, and experimental data almost completely lacking; therefore more satisfactory interpretation of boreal groups must await further field study and collection, even beyond the extensive work of J. P. Anderson, Fernald, Hultén, Polunin, A. E. Porsild, Raup and others.

Key to the Genera

1. Styles 5 (in some species occasionally 4, but predominantly 5).
   2. Sepal-lobes much shorter than the tube; petals appendaged . . 1. *Lychnis.*
   2. Sepal-lobes much exceeding the tube; petals not appendaged . . . . . 2. *Agrostemma.*
1. Styles 3 (in some species occasionally 4, but predominantly 3) . . . . 3. *Silene.*
1. Styles 2.
   3. Calyx ebracteate.
      4. Stamens 10; calyx more than 2 mm. broad.
         5. Flowers 2 cm. or more long.
            6. Calyx tubular, 20-nerved; petals appendaged . . . . . 4. *Saponaria.*
            6. Calyx ovoid, strongly wing-angled, 5-costate; petals not appendaged . . . . . 5. *Vaccaria.*
         5. Flowers 1 cm. or less long . . . . . 6. *Gypsophila.*
      4. Stamens 5; calyx narrowly cylindrical, 1 mm. or less broad . . . . . 7. *Velezia.*
   3. Calyx subtended by 1–3 pairs of bracts.
      7. Calyx 30–40-nerved . . . . . 8. *Dianthus.*
      7. Calyx 5-ribbed or 15-nerved . . . . . 9. *Tunica.*

1. Lychnis L. Sp. Pl. ed. 1. 436. 1753; Gen. ed. 5, no. 517, 198. 1754.

The writer can adduce no new evidence to lend persuasion in the already long-held and extensive discussions that have engaged consideration of generic limitations in the *Silene-Lychnis* com-

[1] For a revision of the North American species of *Silene* see: C. L. Hitchcock & Bassett Maguire, Univ. Wash. Pub. Biol. 13: 1–73. 1947.

plex of the *Silenoideae*. He is compelled by reason of lack of significant or consistent characterization to reject the name *Melandrium* as it has so frequently been applied to segments of both the more natural population assemblages, *Silene* and *Lychnis*. In this respect he follows the long line of eminent students of American botany, Gray, Watson, Robinson, Fernald and Polunin, who have given detailed study to the family.

Key to the Species

1. Capsular dissepiments prominent.
   2. Stems 0.5–3.0 dm. tall; cauline leaves lacking; plants of eastern boreal America and Greenland . . . . . 1. *L. alpina.*
   2. Stems 3.0–8.0 dm. tall; cauline leaves usually 2–4 pairs; occasional weed of northeastern United States . . . . . 2. *L. Viscaria.*
1. Capsular dissepiments completely obsolete, or represented merely by inconspicuous basal ridges.
   2. Plants variously pubescent, but not tomentose; calyx-lobes plane.
      3. Principal leaves 0.5–1.5 cm. wide; cauline leaves 4 pairs or fewer; stems not leafy.
         4. Flowers few (1–9); inflorescence not paniculate.
            5. Flowers nodding in anthesis; petals included or barely exserted; calyx usually conspicuously inflated at maturity; seed wing-margined . . . . . 3. *L. apetala.*
            5. Flowers erect in anthesis; petals included, barely exserted, or conspicuously exserted; seed wing-margined or wingless.
               6. Calyx somewhat inflated; stems 5–30 cm. tall; plants of arctic, boreal, or alpine habitats.
                  7. Petals conspicuously exserted by 3–10 mm.; arctic or boreal.
                     8. Seed wing-margined; stems more or less strongly pubescent, not subpilose; 1-flowered or occasionally loosely 3 (5)-flowered . . . . 4. *L. furcata.*
                     8. Seed wingless; stems subpilose or in ssp. *Dawsoni* more or less strongly pubescent; cymes closely 3–5 (rarely 1)-flowered . . . . . 5. *L. triflora.*
                  7. Petals inconspicuously exserted by 1–3 mm.; alpine plants of central or southern Rocky Mountains . . . . . 6. *L. Kingii.*
               6. Calyx closely investing the capsule; stems 30–60 cm. tall; plants of austral montane habitats.
                  7. Calyx-lobes merely puberulent; stems uniformly finely puberulent, becoming glandular in the inflorescence; plants of western United States and Canada . . . . . 7. *L. Drummondii.*
                  7. Calyx-lobes densely lanate; stems, at least above, more or less lanately pubescent, non-glandular in the inflorescence; plants of Mexico . . . . . 8. *L. mexicana.*
         4. Flowers many; inflorescence openly paniculate . . . 11. *L. Flos-cuculi.*
      3. Principal leaves 1.5–4.0 cm. wide; cauline leaves 5 pairs or more; stems leafy; flowers numerous.
         4. Calyx much inflated; inflorescence not congested.
            5. Flowers white; opening in the evening . . . . . 8. *L. alba.*

5. Flowers red; opening in the morning.....9. *L. dioica.*
4. Calyx not inflated.
5. Inflorescence congested.....10. *L. chalcedonica.*
5. Inflorescence openly paniculate.....11. *L. Flos-cuculi.*
2. Plants densely tomentose; calyx-lobes twisted.....12. *L. coronaria.*

1. Lychnis alpina L. Sp. Pl. ed. 1. 436. 1753. *Viscaria alpina* (L.) G. Don, Gen. Syst. **1:** 415. 1831. *L. alpina* L. var. *americana* Fern. Rhodora **42:** 259. 1940. *L. alpina* L. var. *americana* Fern. forma *albiflora* (Lange) Fern. Rhodora **42:** 259. 1940.

Distribution: A uniform population, mostly of "poorly vegetated areas of well-drained but damp, sandy soil." Boreal western Siberia, Europe, to 70° N. in Greenland, and North America in Labrador, Newfoundland, Gaspé, and the west shore of James Bay, Quebec.

2. Lychnis Viscaria L. Sp. Pl. ed. 1. 436. 1753. *Viscaria vulgaris* Roehl. Deutsch. Fl. **2:** 275. 1812.

Distribution: Cultivated; introduced from Europe, occasionally escaping and apparently rarely persisting as a weed. Maine to New York.

3. Lychnis apetala L. Sp. Pl. ed. 1. 437. 1753.

Key to the Subspecies

1. Calyx conspicuously inflated; 1 (rarely 2–3)-flowered; plants of the arctic regions, ranging south more or less to the 60th parallel.....3a. *L. apetala* subsp. *apetala.*
1. Calyx not conspicuously inflated; 1–3 (5)-flowered; plants of the Rocky Mountains, ranging from more or less the 60th parallel, south.
2. Stems lanate-pilose; leaves narrowly oblanceolate or linear .....3b. *L. apetala* subsp. *attenuata.*
2. Stems puberulent; leaves usually oblanceolate.....
.....3c. *L. apetala* subsp. *montana.*

3a. Lychnis apetala L. subsp. **apetala.** *L. apetala* L. Sp. Pl. ed. 1. 437. 1753. *Melandrium apetalum* (L.) Fenzl in Ledeb. Fl. Ross. **1:** 326. 1842. *Wahlbergella apetala* (L.) Fries, Summa Veg. Scand. 155. 1845. *W. apetala* (L.) Fries, β *arctica* Fries in Öfvers. Vet. Akad. Förhandl. 133. 1869. *L. nesophila* Holm in Fedde, Rep. Spec. Nov. **3:** 338. 1907. *M. macrospermum* A. E. Porsild, Rhodora **41:** 225. 1939. *L. apetala* L. forma *arctica* (Fries) Polunin, Bull. Nat. Mus. Can. no. 92. 184. 1940. *M. apetalum* (L.) Fenzl, ssp. *arcticum* (Fries) Hultén, Fl. Alaska and Yukon 700. 1943.

Type locality: "*Habitat in Alpibus* Lapponicis, Sibiricis."

Distribution: Greatly polymorphic, the exserted petal (forma *arctica*) character seemingly to be correlated with the proterandrous condition; plants of moist habitat; circumpolar; in North America the islands of the Bering Straits, the Aleutian Islands, Alaska, Yukon Territory eastward through arctic

Canada, the Canadian Archipelago (Grant Land 82° 27′ N.), the Hudson Straits region, Labrador, and Greenland (here reaching 83° 6′ N. *Ostenfeld*).

3b. L. APETALA L. var. GLABRA Regel, Bull. Mosc. **34**[2]**:** 570. 1861. Totally glabrous, but otherwise exhibiting the polymorphy of the subspecies; an infrequent variant of no geographical segregation.

TYPE LOCALITY: "Im Felsengebirgern Nordamerika." Type probably the *E. Bourgeau* "Rocky Mountains 1858" collection of the Palliser's Brit. N. Am. Expl. Expedition (? ISOTYPES at Gray Herbarium and New York Botanical Garden).

3b. L. APETALA L. subsp. **attenuata** (Farr) Maguire, comb. nov. *L. attenuata* Farr, Trans. & Proc. Bot. Soc. Penna. **1:**419. 1904.

TYPE LOCALITY: "Lake Louise, near Laggan, July 16, 1904," *E. M. Farr* (University of Pennsylvania).

DISTRIBUTION: Higher altitudes in the Canadian Rocky Mountains, British Columbia and Alberta, Mount Selwyn (56° 1′ N.) south to the Elbow River (49° 40′ N.).

3c. L. APETALA L. subsp. **montana** (S. Wats.) Maguire, comb. nov. *L. montana* S. Wats. Proc. Am. Acad. **12:** 247. 1877.

TYPE LOCALITY: "Mountain peaks of Colorado, (n. 132 Parry)" (Gray Herbarium).

DISTRIBUTION: Meadows and tundra about timber-line, Rocky Mountains, Montana south into Colorado, the Uinta and La Sal Mountains, Utah.

MELANDRIUM MACROSPERMUM AND M. SOCZAVIANUM

For more than a hundred years four species of *Lychnis* had been widely known from arctic America and Greenland, for the greater part polymorphous and variable. Of these *L. alpina*, confined to Greenland and adjacent North America in our range, with almost complete capsular dissepimentation, has never been confused with the other more extensively distributed species having little or no capsular partition, *viz.*: *L. apetala*, *L. furcata*, and *L. triflora*. Of these, *L. triflora*, itself polymorphous with wingless seed and agglomerate inflorescence, is easily separable from *L. apetala* and *L. furcata* with winged seed and but a single flower, or several flowers in an open inflorescence. It is the latter two species and possible relatives that are concerned in the immediate consideration.

Lychnis apetala, completely circumpolar and quite variable, is characterized essentially by its included or shortly exserted lilac-colored, or sometimes white petals, its membranous and finally inflated calyx, its large more or less reniform margined seed with

inflated testa, and most conspicuously by its nodding young flowers that become erect at maturity. Hultén (Fl. Alaska and Yukon 701. 1943) reports, however, particularly in Scandinavia, that the flowers may at times be erect.

Lychnis furcata, likewise, is circumpolar and exceedingly variable, but in contrast to *L. apetala*, has conspicuous white, pink, or reddish petals, flowers erect through anthesis, calyx that more often is firmer, although frequently becoming membranous and inflated, and smaller, inflated, margined seed. Habitally these two species are similar, *L. furcata* commonly becoming somewhat larger than *L. apetala*.

It is thus obvious that at maturity the two species are difficult of separation, the not always dependable seed-differences being the only means of identification. In addition, there are many intermediate plants suggesting frequent hybridization, this possibility gaining credence by Polunin's observations of *L. affinis* (Bull. Nat. Mus. Can. No. 92. pp. 181 and 184. 1940).

Two additional entities have now been recognized for our area that seem to come within the limits of characterization given for (or actually to combine characters of) *L. apetala* and *L. furcata*, viz. *Melandrium macrospermum* A. E. Porsild, and *M. Soczavianum* Schischk., the latter attributed to Alaska by Hultén by two collections, *Anderson 3502* and *3700*, both of which I have before me.

M. macrospermum had been known to Porsild only from the type collection (*A. E. and R. T. Porsild 1147*), distinguished by him from *L. apetala* largely by its "pubescent, urceolate" (the quotations those of Porsild) calyx, as against a "thin, papery, dark purple, puberulent, glutinous, almost globular" calyx; "flower 1 or 2, lateral, long peduncled," as against "flowers solitary (very rarely two), nodding throughout anthesis and erect only when capsule is mature"; and "petals pale rose" as against "petals purple" for *L. apetala*. While admittedly there may be a general "look" in the field that sets the two populations apart, from characters that appear in herbarium-specimens, I am unable to see that *M. macrospermum* so circumscribed does not well come into the limits of *L. apetala*.

Hultén admits *M. macrospermum* to the Flora of Alaska and Yukon, citing a number of collections, among them *Anderson*

5087. This specimen is a good match for *A. E. and R. T. Porsild 988*, likewise from Alaska, distributed as *M. apetalum*.

The two Anderson Alaskan collections cited by Hultén as *M. Soczavianum* are low-growing plants in early anthesis, with nodding heads. They appear to me to be *L. apetala*, but with exserted petals, or to be immature specimens of *L. furcata* with nodding heads. Hultén suggests that these plants might actually be identical with *M. macrospermum*, or indeed might represent an altogether new species.

The writer cannot bring himself to interpret these two collections as belonging to a species distinct from *L. furcata* or *L. apetala* merely on the basis of the combination of characters of the two species, especially in view of the probably frequent hybridization between them.

From the above consideration it becomes necessary to consider *M. macrospermum* to be a part of *L. apetala*, and the American specimens referred to *M. Soczavianum* must be considered as intermediate between *L. apetala* and *L. furcata*.

In the following table attempt has been made to offer comparable and contrastive characters available for the four names discussed.

4. Lychnis furcata[2] (Raf.) Fernald, Rhodora **34:** 22. 1932.

Key to the Subspecies

1. Mature calyx (10) 11–15 mm. long: seed 1.0–1.2 (1.5) mm. broad: plants of Greenland and Arctic America 4a. *L. furcata* subsp. *furcata*.
1. Mature calyx (8) 10–12 (14) mm. long; seed 1.2–1.5 mm. broad; plants of Alaska, Yukon and the western Hudson Bay region . . . . . 4b. *L. furcata* subsp. *elatior*.

4a. Lychnis furcata (Raf.) Fernald, subsp. **furcata.**

Silene furcata Raf. Autikon Botanikon, 28. 1940. *Lychnis furcata* (Raf.) Fern. Rhodora **34:** 22, in large part. 1932. *L. affinis* J. Vahl ex Fries, Nov. Fl. Suec. Mantissa **3:** 36, as to Greenland reference. 1842. *Melandrium pauciflorum* (Ledeb.) Ostenf. Meddel. Grønland **64:** 173, as to Greenland plants. 1923.

If the Siberian *Lychnis pauciflora* Ledeb. Mém. Acad. Pétersb. **5:** 537. 1814, proves to be conspecific with plants interpreted here

[2] Lychnis furcata (Raf.) Fernald, subsp. **affinis** (J. Vahl) Maguire, comb. nov. *L. affinis* J. Vahl ex Fries, Nov. F. Suec. Mantissa **3:** 36, as to type and plants of arctic Europe and Siberia. 1842. *Wahlbergella angustiflora* Rupr. Fl. Samojed. 24, in part. 1843. *Melandrium furcatum* (Raf.) Hultén subsp. *angustiflorum* Hultén, hyponym, Fl. Alaska and Yukon 703. 1943.

L. apetala ssp. *apetala*	*M. macrospermum*	*M. Soczavianum*	*L. furcata*
1. Stems 5–15 (30) cm. tall.	1. Stems 15–25 cm. tall.	1. "Plant resembles M. furcata."	1. Stems 5–35 (40) cm. tall.
2. Flowers nodding in anthesis.	2. Flowers apparently not nodding in anthesis (but not specifically so stated by Porsild).	2. Flowers "sometimes nodding."	2. Flowers erect in anthesis.
3. Calyx inflated, membranous, broadly elliptic-ovate to subglobose, 12–15 (18) mm. long; scantily or moderately pubescent with moniliform pigmented hairs, most densely so along the veins, sometimes completely glabrous, frequently viscid.	3. Calyx "urnshaped" 1.5 cm. long, 1.0 cm. wide, "pubescent."	3. Calyx elliptic-ovoid 10–12 mm. long, (immature), subpilose.	3. Calyx 10–16 mm. long, elliptic-ovoid, sometimes becoming inflated and membranous at maturity, moderately puberulent and sometimes glandular, to densely pilose with moniliform pigmented hairs, and viscid, rarely completely glabrous.
4. Petals included or exserted by 1–3 mm., white or lilac-colored.	4. Petals "barely exserted, rose."	4. Petals "long and dark lilac colored instead of white."	4. Petals conspicuously exserted, white pinkish or reddish.
5. Seed reniform-orbicular, 1.5–2.5 mm. broad, testa light brown, inflated, forming an inflated or collapsed winged margin equalling or somewhat less than the diameter, of the embryo; the surface with more or less conspicuous rounded or flattened papillae.	5. Seed, "reniform, pale brown, 2.0–2.4 mm. wide and 1.8 mm. long, strongly punctate, with broad inflated wing."	5. Seed unknown to the writer.	5. Seed 1.0–1.5 mm. broad, subreniform, the testa inflated, forming a winged margin, the surface almost smooth.

as *L. furcata* (so concluded by Prof. Ostenfeld), then the older epithet *pauciflorum* would supersede any other now applied to this diverse circumpolar entity.

Type locality: "Labrador and Hudson Bay." Type unknown.

Distribution: Eastern Arctic America, northern Labrador, Greenland, Spitzbergen, and Nova Zembla.

4b. Lychnis furcata (Raf.) Fernald, subsp. **elatior** (Regel) Maguire, comb. nov. *L. apetala* L. var. *elatior* Regel, Bull. Mosc. **34**[4]**:** 573, most part. 1861. *L. Taylorae* Robinson, Proc. Am. Acad. **28:** 150. 1893. *Melandrium Taylorae* (Robins.) Tolm. Trav. Mus. Bot. Acad. Sc. U. R. S. S. **24:** 267. 1932. *L. brachycalyx* Raup, Sargentia **6:** 173. 1947.

The species *L. brachycalyx* as proposed by Dr. Raup, has been characterized as distinct from *L. furcata* essentially by its short calyx, which in the type (Colonel Mt. Brintnell Lake, S. W. Mackenzie, *Raup 9821*, stated to be "occasional in this situation but not seen elsewhere.") is "11.5 mm. crasso et 9 mm. alto", compared with *L. furcata* in which "the calyx is 9–12 mm. broad and 12–15 mm. high." No specimens of this have been seen by the writer. From the description and figure (l. c. p. 174), it would seem that the plants in question are closely similar to the following and with them may be associated with *L. furcata.* ssp. *elatior*, viz.: Klondike River, July 15, 1902, *John Macoun, Geol. Surv. Can. 58402;* Churchill, July 26–Aug. 18, 1910, *J. M. Macoun, Geol. Surv. Can. 79078;* stream by West Dawson, July 30, 1899, *R. S. Williams sine no.;* and Peel River, Mackenzie River Delta, July 15, 1892, *E. Taylor*, the type of *Lychnis Taylorae.* These specimens with calyx from 8–12 mm. long and reduced petals have been interpreted as depauperate or etiolated plants.

Type Locality: "Baicalien, am Flusse Bargusin (Turczaninoff). Russisches America in Kadjak. (Exp. d. Admiralität)."

Distribution: Eastern Arctic Asia, Alaska, and Yukon, eastward to the Hudson Bay Region, Manitoba, and possibly along the Arctic coast. A more eastern collection that seemingly belongs here is, Lake Harbour, Baffin Island, *Polunin 434* (Gray Herbarium).

Lychnis furcata subsp. elatior var. **glabra** (Hultén) Maguire, comb. nov. *L. Funstonii* Wight ex Mertie, U. S. Dept. Inter. Geol. Surv. Bull. 836-E: 364. 1932. Nomen. *Melandrium*

Taylorae (Robins.) Tolm. var. *glabrum* Hultén, Fl. Alaska and Yukon **4:** 705. 1932.

TYPE LOCALITY: Coal Creek Hill, Central Yukon River, Alaska, *Funston* 81. ISOTYPE, New York Botanical Garden.

As suggested by the name, this plant is glabrous and seems to be no more than a glabrous form of the subsp. *elatior*. Other than the type, there seems to be no record of glabrous specimens of the subspecies within our range.

5. LYCHNIS TRIFLORA R. Br. in Ross' Voy. Disc. Append. 142. 1819.

KEY TO THE SUBSPECIES

1. Stems 5–15 (20) cm. tall, pubescence more or less densely sub-pilose; mature calyx 10–12 mm. long, ellipsoid-campanulate to campanulate; seed muricate-tuberculate on the back; apparently confined to Greenland.....5a. *L. triflora* subsp. *triflora*.
1. Stems 15–30 cm. tall, villous or merely puberulent; mature calyx 8–10 mm. long, narrowly ellipsoid-campanulate; seed low-tuberculate on the back; Arctic Canada..5b. *L. triflora* subsp. *Dawsoni*.

5a. LYCHNIS TRIFLORA R. Br. subsp. **triflora.** *L. triflora* R. Br. in Ross' Voy. Disc. Append. 142. 1819.

TYPE LOCALITY: Greenland.

DISTRIBUTION: Apparently confined to Greenland (cf. A. E. Porsild, Sargentia **4:** 36. 1943); possibly also "east coast of Baffin" (cf. Polunin, Bot. Can. East. Arctic 183. 1940).

5b. LYCHNIS TRIFLORA R. Br. subsp. **Dawsoni** (Robins.) Maguire, comb. nov. *L. triflora* R. Br. var. *Dawsoni* Robins. Proc. Am. Acad. **28:** 149. 1893. ? *Melandryum taimyrense* A. Tolm. Trav. Bot. Mus. Acad. Sci. U. R. S. S. **24:** 264. 1932. ? *M. Ostenfeldii* A. E. Porsild, Sargentia **4:** 37. 1943. *L. Dawsonii* (Robins.) J. P. Anderson, Iowa State College Journ. Sci. **20:** 251. 1946.

TYPE LOCALITY: 100 miles northeast of Dease Lake, British Columbia, *Dr. G. M. Dawson* (Gray Herbarium).

DISTRIBUTION: gravelly banks and rocky places, the region of Great Slave Lake and northward; Copper Center, Alaska, *Anderson 2047*.

In the proposal of *M. Ostenfeldii*, Porsild (l. c.) had unfortunately overlooked Robinson's *L. triflora* var. *Dawsoni*. The type of var. *Dawsoni* and *Dawson 2649* from Dease River, lat. 59° N. quite faithfully fit into the description of *M. Ostenfeldii*. The subsp. *Dawsoni* may be specifically distinct from *L. triflora*.

6. LYCHNIS KINGII S. Wats. Proc. Am. Acad. **12:** 247. 1877. *L. ajanensis* S. Wats. Bot. King's Expl. Exped. **5:** 37. 1871, not *L. ajanensis* Regel, Bull. Soc. Nat. Mosc. **34**[2]**:** 564. 1861.

Type locality: "Peaks of the Uintas at head of Bear River." Utah, *Parry 43* (Gray Herbarium).

Distribution: Alpine regions, Rocky Mountains, Wyoming, Colorado and Utah.

7. Lychnis Drummondii (Hook.) S. Wats. Bot. King's Expl. Exped. **5:** 37. 1871.

Key to the Varieties

1. Petals included.....7a. *L. Drummondii* var. *Drummondii.*
1. Petals exserted by 2–4 mm.....7b. *L. Drummondii* var. *striata.*

7a. Lychnis Drummondii var. **Drummondii.** *L. Drummondii* (Hook.) S. Wats. Bot. King's Expl. Exped. **5:** 37. 1871. *Silene Drummondii* Hook. Fl. Bor.-Am. **1:** 89. 1830.

Melandrium Drummondii (Hook.) Hultén, Fl. Alaska and Yukon **4:** 702. 1944.

Type locality: "Plains of the Saskatchewan. *Dr. Richardson; Drummond.* Common on . . . gravelly soils, near Fort Vancouver, and skirting the Blue Mountains. *Douglas.*"

Distribution: Open montane slopes and woodlands, to 11,000 feet; Northwest Territory and British Columbia to Saskatchewan and North Dakota to Washington?, western Nebraska, Colorado, northern Arizona and southern Nevada.

7b. Lychnis Drummondii var. **striata** (Rydb.) Maguire, comb. nov. *L. striata* Rydb. Bull. Torrey Club **31:** 408. 1904. *L. Drummondii* (Hook.) S. Wats. var. *nuda* Maguire, Madroño **6:** 26. 1941, not *L. nuda* S. Wats. Bot. King's Expl. Exped. **5:** 37. 1871.

Similar to the var. *Drummondii* but with exserted petals.

Type locality: Cameron Pass, Colorado, 1896, *C. F. Baker* (New York Botanical Garden).

Distribution: Occurring with the typical population, and seemingly mostly confined to the center of distribution in Wyoming, Idaho, Utah, and Colorado. Possibly not varietally distinct.

8. Lychnis mexicana Rose, Contr. U. S. Nat. Herb. **5:** 141. 1897.

Apparently known only by two collections, the types: Sierra de Ajusco, altitude 3,215 meters, 1896, *C. G. Pringle 6456;* and Lava beds, La Cima de Ajusco, 9800 feet, Aug. 2, 1906, *Pringle 13774.* Both specimens have stems that are nearly glabrous at the base, and very thinly lanate towards the summit.

9. Lychnis alba Mill. Gard. Dict. ed. 8. no. 4. 1768. *L. vespertina* Sibth. Fl. Oxon. 146. 1794. *Melandrium vespertinum* (Sibth.) Fries, Bot. Notiser 170. 1842.

Distribution: A weedy species naturalized from Europe, frequent in eastern North America; from Nova Scotia and Quebec to Michigan and Washington, southward to California,

Utah, Missouri and Georgia, perhaps the distribution more extended. Frequently confused with *Silene noctiflora.*

10. Lychnis dioica L. Sp. Pl. ed. 1. 437. 1753. *L. dioica* var. *rubra* Weigel, Fl. Pom.-Rug. 85. 1769. *L. diurna* Sibth. Fl. Oxon. 145. 1794.

Distribution: Introduced from Europe, occurring as a weed in eastern North America; Newfoundland, Nova Scotia, Quebec, Ontario and Minnesota, south to Virginia and Missouri.

11. Lychnis chalcedonica L. Sp. Pl. ed. 1. 436. 1753. Genotype. *Agrostemma chalcedonica* (L.) Döll, Rhein. Fl. 643. 1843.

Distribution: Introduced into cultivation from Asia; in America escaped and now occasionally spontaneous in the Northeast, from Prince Edward Island and Maine to Michigan, probably elsewhere.

12. Lychnis Flos-cuculi L. Sp. Pl. ed. 1. 436. 1753. *Melandrium Flos-cuculi* (L.) Roehl. Deutschl. Fl. ed. 2. 275. 1812. *Coronaria Flos-cuculi* (L.) A. Br. in Flora **26:** 368. 1843.

Distribution: Of European origin, escaped from cultivation and frequently naturalized; waste places, Quebec, New Brunswick, New England and New York.

13. Lychnis coronaria (L.) Desr. in Lam. Encycl. **3:** 643. 1789. *Agrostemma coronaria* L. Sp. Pl. ed. 1. 436. 1753. *Coronaria tomentosa* A. Br. in Flora. **26:** 368. 1843.

Distribution: Of European origin, frequently escaped from cultivation and now apparently established in many areas; Maine, Vermont, Massachusetts, New York, Ohio, Indiana, British Columbia, Washington, Oregon, and probably elsewhere.

2. Agrostemma L. Sp. Pl. ed. 1. 435. 1753; Gen. ed. 5, 198. 1754.

1. Agrostemma Githago L. Sp. Pl. ed. 1. 435. 1753. *Lychnis Githago* Scop. Fl. Carn. ed. 2. **1:** 310. 1772.

Distribution: Middle and southern Europe; introduced and widely established as a weed of grain fields, roadsides and waste places in much of temperate North America.

3. Silene L. Sp. Pl. ed. 1. 416. 1753.

For a revision of the North American species of Silene see: Hitchcock and Maguire, Pub. Wash. Univ. Biol. **13:** 1–73. 1947.

4. Saponaria L. Sp. Pl. ed. 1. 408. 1753; Gen. ed. 5. 191. 1754.

1. Saponaria officinalis L. Sp. Pl. ed. 1. 408. 1753.

Distribution: Of Old World origin; common in cultivation and frequently escaped, easily becoming spontaneous along roadsides and in waste places, spreading by rootstalks. To be found in most of temperate North America.

5. Vaccaria Medic. Phil. Bot. **1:** 96. 1789.

1. Vaccaria segetalis (Neck.) Garcke ex Aschers. Fl. Brandenb. **1:** 84. 1864. *Saponaria segetalis* Neck. Delic. Gallo-Belg. **1:** 194. 1768. *Vaccaria pyramidata* Medic. Phil. Bot. **1:** 96. 1789. *Saponaria Vaccaria* L. Sp. Pl. ed. 1. 409. 1753. *Vaccaria Vaccaria* (L.) Britt. in Britt. & Brown Ill. Fl. **2:** 18. 1897.

Distribution: Of European origin; a weed largely throughout temperate North America, as far north as Alaska. Frequently abundant in grain fields.

6. Gypsophila L. Sp. Pl. ed. 1. 406. 1753. Gen. ed. 5, 191. 1754.

Key to the Species

1. Annual; diffuse, the stems 1.0–1.5 dm. tall; flowers axillary . . 1. *G. muralis.*
1. Perennial or annual; the stems 2 or more dm. tall; inflorescences paniculate.
   2. Calyx 2.0–2.5 mm. long; petals 5 mm. or less long . . . . . 2. *G. paniculata.*
   2. Calyx 4–5 mm. long; petals ca. 10 mm. long . . . . . 3. *G. elegans.*

1. Gypsophila muralis L. Sp. Pl. ed. 1. 408. 1753.

Distribution: Widely distributed in Eurasia; established locally as a weed in New England, Michigan and Minnesota.

2. Gypsophila paniculata L. Sp. Pl. ed. 1. 407. 1753.

Distribution: Middle and southern Europe to western Siberia; escaped from cultivation and locally established in Manitoba and Nebraska, perhaps elsewhere.

3. Gypsophila elegans Bieb. Fl. Taur. Cauc. **1:** 319. 1808.

Distribution: Caucasia, Armenia, and the upper Euphrates region; reportedly escaped from cultivation and established in North Dakota.

7. Velezia L. Sp. Pl. ed. 1. 332. 1753; Gen. ed. 5, 155. 1754.

1. Velezia rigida L. Sp. Pl. ed. 1. 332. 1753.

Distribution: Southern Europe, and the Mediterranean area; in North America established as a weed from northern to central California.

8. Dianthus L. Sp. Pl. ed. 1. 409. 1753; Syst. ed. 1. 710. 1753; Gen. ed. 5, 191. 1754.

Key to the Species

1. Flowers solitary or few.
   2. Rootstalk slender, branched; stems slender, branched; calyx 12–15 mm. long . . . . . 1. *D. deltoides.*
   2. Rootstalk coarse or the caudex multicipital.
      3. Leaves mostly basal; stems mostly 2–3 dm. tall; infrequent weed in New England . . . . . 2. *D. plumarius.*
      3. Leaves not conspicuously basal; stems mostly 1 dm. or less tall; indigenous to Alaska . . . . . 3. *D. repens.*
1. Flowers many in a congested inflorescence.
   4. Perennial; leaves 10–18 mm. broad . . . . . 4. *D. barbatus.*
   4. Biennial; leaves 2–8 mm. broad . . . . . 5. *D. Armeria.*

1. Dianthus deltoides L. Sp. Pl. ed. 1. 411. 1753.

Distribution: Introduced from Europe; locally established as a weed, New Hampshire and Vermont to New York.

2. Dianthus plumarius L. Sp. Pl. ed. 1. 411. 1753.

Distribution: Central and southeastern Europe; escaped from cultivation and established locally in New Hampshire and Massachusetts.

3. Dianthus repens Willd. Sp. Pl. **2:** 681. 1799. *D. alpinus* ν *repens* (Willd.) Regel, Bull. Mosc. **34**[4]**:** 530. 1861.

Distribution: Arctic Europe and Siberia; Bering Straits; in Alaska from Cape Lisburne and the central Yukon south to Lake Tustumena.

4. Dianthus barbatus L. Sp. Pl. ed. 1. 409. 1753. Genotype. *Diosanthos barbatum* St. Lager. Fl. Pyr. **3:** 93. 1901.

Distribution: Escaped from cultivation, locally established from Vermont to Michigan, south to New York.

5. Dianthus Armeria L. Sp. Pl. ed. 1. 410. 1753. *Diosanthus Armerium* St. Lager, Ann. Soc. Bot. Lyon, **7:** 87. 1880.

Distribution: Introduced from Europe; spontaneous as a weed, Quebec and Ontario to Montana, Idaho, British Columbia and Washington, south to Missouri to Georgia.

9. Tunica Scop. Fl. Carn. ed. 2. **1:** 298. 1772.

Key to the Species

1. Annual; calyx 10–13 mm. long . . . . . 1. *T. prolifera.*
1. Perennial; calyx 4–5 mm. long . . . . . 2. *T. Saxifraga.*

1. Tunica prolifera (L.) Scop. Fl. Carn. ed. 2. **1:** 299. 1772. *Dianthus prolifer* L. Sp. Pl. ed. 1. 410. 1753.

Distribution: Introduced from Europe; sparingly established in waste places, New York to South Carolina, and California.

2. Tunica Saxifraga (L.) Scop. Fl. Carn. ed. 2. 300. 1772. *Dianthus Saxifragus* L. Sp. Pl. ed. 1. 413. 1753.

Distribution: Introduced from Europe; established as a roadside weed. Flushing, L. I.; probably elsewhere.

New York Botanical Garden

DEATH OF MERRITT LYNDON FERNALD

It is with great regret that we record the sudden death, on September 22, 1950, of Professor Merritt Lyndon Fernald, an editor of Rhodora since its inception, and Editor-in-Chief since 1929.

The Editorial Board

THE VALIDITY OF THE GENERIC NAME PTERETIS

M. L. Fernald

The Ostrich-Fern of Eurasia, first placed by Linnaeus in *Osmunda*, was separated by Willdenow, Enum. 1071 (1809) as the genus *Struthiopteris* (L). Willd.; but the ancient generic name *Struthiopteris* had already been applied, after 1753, to other genera: especially by Weis in 1770 for the plant called by Linnaeus (1753) *Osmunda spicant* and later called *Blechnum spicant* (L.) Roth (1794). The name *Struthiopteris* Willd. (1809) was, therefore, a later homonym and has until recently been replaced by *Matteuccia* Todaro (1866). In 1818, however, Rafinesque had substituted for *Struthiopteris* Willd., which was an illegitimate name because of the earlier *Struthiopteris* of Weis (1770), the name *Pteretis* Raf. in Am. Mo. Mag. Crit. Rev. ii. 268 (1818), a new name given as a substitute for *Struthiopteris* Willd. (1809), not Weis (1770). This matter was discussed in great detail by Nieuwland in Am. Midl. Nat. iii. 194–197 (1914), although Nieuwland, with his devotion to pre-Linnaean names, somewhat involved the discussion. His summarizing paragraph, omitting the references prior to 1753, was as follows:

> **Pteretis** Raf. Am. Month. Mag., II., p. 268, (1818).
> *Matteuc*[*c*]*ia* Todaro, Geor. Sci. Nat. Palermo, I., p. 235, (1866).
> *Stri*[*u*]*thiopteris* Willd. Enum. p. 1071, (1809) . . . not *Struthiopteris* . . . Weiss [Weis] . . . = *Lomaria Spicant* (Linn.) Desvaux.

Nieuwland's taking up of *Pteretis* was the correct course, in spite of his typographic carelessness and his error, under the new combination *Pteretis Struthiopteris* (Linn.) Nieuwland, in citing the basonym as "*Matteucia Struthiopteris* Linn. Sp. Pl. p. 1066, (1753)" instead of *Osmunda Struthiopteris*, the name used by Linnaeus.

Others correctly took up *Pteretis* (1818) as a properly published generic name; but Copeland, Gen. Fil. 103 (1947), using *Matteuccia* (1866), rejects *Pteretis* (1818) because it "was never tolerably published". However, admitting the eccentricity of Rafinesque's methods, there seems to be no question of its validity, as indicated in the International Rules of Botanical Nomenclature, Art. 42 (2), which reads:

A name of a genus is not validly published unless it is accompanied . . . (2) by the citation of a previously and effectively published description of the genus under another name.

As an example of such valid publication the Rules give

Thuspeinantha Th. Dur. (*Ind. Gen. Phanerog.* p. x: 1888), accompanied by a reference to the previously described genus *Tapeinanthus* Boiss. (non Herb.).

Pteretis Raf. was quite parallel with *Thuspeinantha:* the replacement of an invalid earlier name of a genus which was properly described; and as such it was listed by Christensen, Ind. Fil. Suppl. ii, 30 (1917). The name was taken up by me in Rhodora, xxxvii. 219 (1935) and by Small, Ferns Vic. N. Y. 140 (1935); by Merrill in Am. Fern. Journ. xxxiii. 56 (1943) and his Ind. Raf. 72 (1949) with correct bibliography as a "*Nomen validum*"; and its adoption in the American Fern Journal and by most recent students in America speaks for itself. Many botanists have regretted (and so stated) the frequent upsets in the names of our North American Ostrich-Fern, *Pteretis pensylvanica* (Willd.) Fern. in Rhodora, xlvii. 123 (1945). Now, "Malgré la synonymie chargée de cette fougère", M. Marcel Raymond, feeling that "on ne peut employer *Pteretis* Raf., parce que, comme Copeland l'a démonstré avec authorité . . . ce genre n'a jamais été publié conformément aux règles", has added to the synonymy another name: *Matteuc[c]ia pensylvanica* (Willd.) Raymond in Naturaliste Canad. lxxvii. 55 (1950). This combination, published under a misconception, will stand only if the perpetually tinkered "permanent" Rules are altered by the conservation of *Matteuccia.*

The seeming Invalidity of some Substitutes for the Name Habenaria straminea.—In Rhodora, xxviii. 174 (1926) the species *Habenaria straminea* Fernald was first published, its type from calcareous barrens along the Straits of Belle Isle in northern Newfoundland, but the species also occurring in southern Greenland, Iceland and on the Faroe Islands, where it had been misidentified with the European *H. albida* (L.) R. Br. In 1929 Mr. Frank Morris, doubting the specific distinctness of our plant, called it *H. albida* (L.) R. Br., var. *straminea* (Fern.) F.

Morris in Morris & Eames, Our Wild Orchids, 69, plates 23 and 24 (1929); and in Rhodora, xxxv. 237–239, t. 251, figs. 1 and 2 (1933) I showed by photography, the new species and enlarged flowers (fig. 3) of the European *H. albida.* To me, as to Asa Gray, Sereno Watson, Britton and Ames, the latter a life-long student of the *Orchidaceae, Habenaria* is a natural and inclusive genus. To many Europeans, with far fewer representatives of the group than in North America, it is a series of genera. Nevertheless, in other and less sensational families than the *Orchidaceae* they do not segregate groups with profound morphological differences into microgenera! Surely, *Salix,* § *Reticulatae* Fries, the genus *Chamitea* Kerner, is in its morphological characters, geographic range and habit more strikingly unlike § *Pentandrae* Dumort., the genus *Lusekia* Opiz, than are the reputed generic segregates of *Habenaria.* Nevertheless, *Salix,* with relatively inconspicuous flowers, is kept intact. Plenty of other aggregate-genera, which are quite as separable as the elements in inclusive *Habenaria,* are kept intact by the *Habenaria*-splitters: such groups as *Saxifraga* or *Rubus,* for example; for, if there are subgenera or sections as definitely separable as are the reputed genera of the aggregate *Habenaria,* they occur in *Rubus. Rubus* subgenera *Chamaemorus* (Ehrh.) Focke, *Cylactis* (Raf.) Focke (Genus *Cylactis* Raf.), *Idaeobatus* Focke and *Eubatus* Focke are quite as eligible for generic separation as are the so-called genera segregated in Europe (and, of course, by Small, Rydberg and their followers in America) from the natural group, *Habenaria.*

The primary object of this note, however, is to protest against the very doubtful and apparently illegitimate publication of alternative or provisional combinations without regard for the International Rules of Botanical Nomenclature. Prior to the International Congress of 1930 the unfortunate situation was realized and discussed, but it was soon referred to the Executive Committee for decision, an effective means of wholly side-tracking it. At Amsterdam in 1935 (see Sirks, Zesde Internat. Bot. Congr. Proc. i. 364, 366 (1936)) the matter (Art. 37 ter) was discussed and the article was accepted:

> A name of a taxonomic group is not validly published unless it is definitely accepted by the author who published it. A name proposed provisionally (nomen provisorium) in anticipation of the eventual acceptance of the group, or of a particular circumscription, position or

rank of a given group, or merely mentioned incidentally is not validly published.

The special example brought before the Congress was "the case of the name *Cymbopogon Eequaertii* and *Andropogon Bequaerti* published simultaneously in *Bull. Jard. Bot. Bruxelles*, vi. p. 8 (1919) as follows."

> "*Cymbopogon Bequaertii* DeWild. nov. sp.
> *Andropogon Bequaertii* DeWild. nom. nov."

In the case at issue Löve in Botaniska Notiser (1950) 36, 37, wrote of the plant validly published as *Habenaria straminea* Fernald in RHODORA, xxviii. 174 (1926) and RHODORA, xxxv. 237, t. 251, figs. 1 and 2 (1933):

> If named as species, the Icelandic-American type should bear the name *Leucorchis straminea* (FERN.) LÖVE, comb. nova (based on *Habenaria straminea* FERNALD, 1926, p. 174), but if placed as subspecies under the species *Leucorchis albida* it should be named ssp. *straminea* (FERN.) LÖVE, ssp. nova (based on *Habenaria straminea* Fernald, l. c.). In the latter case, the subspecies name ssp. *eu-albida* LÖVE, ssp. nova (based on *Satyrium albidum* L. 1753; *Habenaria albida* [L.] B. BR. s. str., excl. *H. stràminea* FERN.) would be appropriate for the European type.[1]

These combinations by Löve are all too tentative; they are the provisional or alternative types of names specially aimed at by Art. 37ter of the International Rules.—M. L. FERNALD.

[1] Löve gives a map (his fig. 7) in which he shows *H. straminea* in North America radiating from the Straits of Belle Isle northward into Labrador where it is unknown, and half-way down the *eastern* side of Newfoundland where it is also unknown. In Newfoundland it extends from the eastern end of the Straits southwestward along the calcareous coast!

OUR AMERICAN FORMS OF STELLARIA ALSINE

M. L. Fernald

Stellaria Alsine Grimm in Nov. Act. Phys.-Med. Nat. Cur. iii. App. 313 (1767); Hoffm. Deutschl. Fl. 153 (1791). *S. uliginosa* Murr. Prodr. Comm. Gött. 55 (1770).

As pointed out by Handel-Mazzetti, Symb. Sin. Teil vii. 191 (1929), the characteristic plant of Eurasia and eastern North America, which has long been known as *Stellaria uliginosa* Murr. or *Alsine uliginosa* (Murr.) Britt., was first described as *S. Alsine* by Grimm in 1767, three years earlier than Murray's name and nearly a quarter-century before the independent publication of *S. Alsine* Hoffm. (1791). Grimm, using binomials, took the primary diagnosis from the pre-Linnaean at least in nomenclature Haller, source of many names taken over by post-Linnaean authors.

Innumerable minor variations of the plant have been defined in Eurasia, but most of them (under *Stellaria uliginosa*) seem to be mere responses to depth of water or degree of stranding—13 such forms enumerated by Gürke and 14 by Ascherson & Graebner. For the most part they seem very trivial, but two of them which occur in eastern North America are sufficiently striking as to attract notice. These are

Stellaria Alsine Grimm, forma **ovalifolia** (Peterm.) comb. nov. *Larbrea uliginosa*, aa. *ovalifolia* Peterm. Fl. Lips. 326 (1838). *S. uliginosa*, var. *latifolia* Peterm. Analyt. Pflzschlüssel Exc. Leipz. 57 (1846). *S. uliginosa*. forma *ovalifolia* (Peterm.) Aschers. & Graebn. Syn. Mitteleur. Fl. v. 547 (1917).

Typical *Stellaria Alsine*, the usual plant with us, has elongate stems and the leaves are elliptic-lanceolate or narrowly lance-ovate, the principal blades mostly 1–2.5 cm. long and 2–7 mm. broad and in distant pairs. It is well represented by Pl. Exsicc. Gray. no. 211. Forma *ovalifolia* has the oval or broadly elliptic leaves relatively much broader (two-fifths to three-fifths as broad as long), the larger ones up to 3.5 cm. long, though in its smallest extreme only 0.8–1 cm. long but 5–6 mm. wide. This form is represented by very extreme specimens from Cap à l'Aigle, St. Pierre, St. Pierre et Miquelon, 5 juillet 1900, *Arsène* (with leaves up to 3.5 cm. long); ledges of damp sea-cliffs,

Torbay, NEWFOUNDLAND, *Howe & Lang*, no. 1373 (suggesting large *S. media*); seepy clay bank near Great Bras d'Or, Iona, NOVA SCOTIA, *Fernald & Long*, no. 21,208 (leaves unusually short); Wilmington, DELAWARE (without further data), *Edward Tatnall.*

In the other direction the most extreme form is a plant only 0.5–1 dm. high, with subapproximate pairs of lanceolate firm leaves only 4–12 mm. long, and with very short peduncles. This is

S. ALSINE, forma **alpina** (Schur), comb. nov. *Larbrea uliginosa*, b. *alpina* Schur, Enum. Pl. Transs. 115 (1866). *S. uliginosa* Murr., n. *alpina* (Schur) Gürke in Richter ed. Gürke, Pl. Eu. ii. 210 (1899). *S. Alsine*, var. *alpina* (Schur) Handel-Maz., Symb. Sin. Teil vii. 191 (1929).

In Eurasia this form is usually subalpine. With us it is known only from ST. PIERRE ET MIQUELON: lieux humides, ruis scaux, fossés, Cap à l'Aigle, *Arsène*, no. 241. Some specimens from Newfoundland approach it.

THALLOPHYTES AND BRYOPHYTES OF THE CANADIAN EASTERN ARCTIC.[1]—This represents the materialization of a volume which must have come near to being a wartime casualty. The work on which it is based was completed early in 1939 and the manuscript submitted for publication shortly thereafter. In its final form it is heavily documented by footnotes by the editor, most of which were added in 1946, in an effort to keep the manuscript up to date. The present volume, covering the nonvascular cryptogams of the region, is a follow-up of volume I, which was prepared by Polunin and which appeared in 1940, covering the Pteridophytes and Spermatophytes of approximately the same geographical area.

The region covered in the study includes an area of about 1,000,000 square miles of which a little less than half is said to be land. It is the area of Northeastern Canada lying roughly north of the 60th parallel and east of longitude 95 degrees west. An attempt is made to bring together in this one volume for the first time records of all the entities thus far known from the region whether previously published or not. This is said to have been accomplished for all the groups studied with the exception of the fungi and algae where older records have not been cited in detail but may be traced by the interested investigator through the cited literature. The foundation material for the volume is the collections made by Polunin and his associates in expeditions into the regions during the period 1934–36.

The contents of the volume consist of a Forword, General Introduction, Summary, and Index to Latin names, all prepared by Polunin, and the main body of the work consisting of seven papers on the various groups of crypto-

[1] *Botany of the Canadian Eastern Arctic*, Part II, *Thallophyta* and *Bryophyta*, compiled and edited by NICHOLAS POLUNIN, National Museum of Canada, Bulletin 97 (Biological Series 26): [I]–V + [I]–573. *18 plates, text-figure 1–5, pocket map at back*, 1947. Price: $1.00.

gams, each prepared by a specialist in the particular group. These papers are as follows: *Algae* by Roy M. Wheldon, 13–137; *Marine Phytoplankton* by Gunnar Seidenfaden, 138–177; *Freshwater Diatomeae* by Robert Ross, 178–233; *Fungi* by David H. Linder, 234–297; *Lichens* by Bernt Lynge, 298–369; *Musci* by William C. Steere, 370–490; *Hepaticae* by Nicholas Polunin, 491–513. The total number of *species* recorded in the work is 1453 (remembering that previous reports are not included for the groups algae and fungi). The breakdown by group is algae 383, marine phytoplankton 125, freshwater diatoms 192, fungi 79, lichens 280, mosses 314, and liveworts 82. Each paper is essentially complete in itself and conforms in general to a prearranged pattern. It contains a general account followed by a list of species with literature and specimen citations, giving also general distribution and distribution within the area, but for the most part omitting descriptions except where proposed new taxonomic categories require it, and ending with a bibliography.

There are few of us who would be prepared to offer very much in the way of critical comment on a work of this sort. It certainly shows persistence and conscientious attention to detail on the part of the editor under a prolonged set of difficult and discouraging circumstances. It is an important work which will be fundamental to studies of the cryptogams of this and other northern regions for years to come. And in view of the presently stepped-up penetration of man into these regions it is to be assumed, and certainly to be hoped, that there will be increased attention to the cryptogamic as well as the higher forms of plant life which exist there.

Judgment as to whether or not the various specific determinations are accurate and critical and whether the "new species" described in some groups are really new might well be reserved until the specimens have been worked and reworked—with the passing of the years—for the type of monographic work that is needed to correlate the species of a region like this with those of other areas and to adequately find the limits of variation of the separate species, proceeds very slowly indeed. Being more familiar with the fungi than with the other groups treated I would venture a comment on that group alone. For one man to undertake to determine the fungi—from *Micromyces* to *Lycoperdon*—is, in view of the present state of our mycological literature, a pretty broad undertaking. One mycologist who specializes in the Agaricaceae has remarked to me that the treatment of that family in this volume was accurate enough to enable one who was familiar with the gill fungi on a world-wide basis to make an intelligent guess as to what species was represented.—W. Lawrence White.

Volume 52, no. 621, including pages 209–228, was issued 19 September, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

REED CLARK ROLLINS, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
RICHARD ALDEN HOWARD
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Vol. 52. November, 1950. No. 623.

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Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. **November, 1950** **No. 623**

NOTES ON DISTRIBUTION OF NORTH CAROLINA PLANTS—II

William B. Fox, R. K. Godfrey and H. L. Blomquist

This is the second[1] in a series of papers dealing with noteworthy records of plants in North Carolina and, for the most part, is based on collections made by the authors during the season of 1949 and early 1950. However, examination of herbaria and literature have yielded collections or records by others, some of which will be cited herein.

Collections in the *Leguminosae* and *Compositae* are not included in this paper since the first two authors plan to publish on these families separately.

In the first paper in this series our information was based primarily on collections in herbaria within the state and on the literature at our disposal. For this one it has been possible, in addition, to check named collections in the Gray Herbarium and the herbarium of the New York Botanical Garden for all of those species for which such a check seemed desirable. Unless otherwise indicated, all specimens cited are in the herbarium of North Carolina State College. Citation of references and the order of enumeration of genera and species follow the plan used in the first paper.

The A. A. A. S. grant, through the North Carolina Academy of Science, awarded to the first two authors in 1949, aided substantially in the defrayment of travel expenses. We wish to express our appreciation to members of the botany department

[1] See Fox and Godfrey, "Notes on Distribution of North Carolina Plants—I, Rhodora 51: 129–146. 1949.

of the University of North Carolina for the privilege of making frequent use of their facilities, and to the director of the Highlands Biological Station, Dr. Thelma Howell, for courtesies extended to the first two authors during their stay there in August, 1949. We are indebted to the late Professor M. L. Fernald of the Gray Herbarium for reading the manuscript and making valuable suggestions and to Dr. D. S. Correll of the Bureau of Plant Industry, Beltsville, Maryland, for checking his extensive set of records on the flora of North Carolina for collections and records pertinent to this paper and for furnishing us with collection-data from certain specimens in the National Arboretum Herbarium and the U. S. National Herbarium.

Azolla caroliniana Willd. Wake County: farm-pond, on U. S. Rt. 1, 6 miles n. of Raleigh, June 26, 1947, *Fox & Whitford;* pond, 1 mile s. of Eagle Rock, May 19, 1950, *Whitford.*

Blomquist and Oosting (1948) do not include this fern as a part of the piedmont flora. Blomquist (1934) records it from two coastal counties, New Hanover and Currituck, and Blomquist and Correll (1940) add Brunswick County.

Lycopodium obscurum L. Warren County: Fishing Creek Township, 8 miles s.e. of Warrenton, January 15, 1950, *L. W. Reams;* Northampton County: Jackson, on small hillsides sloping to swamps, November, 1901, *W. Paul Moore s.n.* (in Nat. Arb. Herb.); Hertford County: sloping pine-woods, near swamp, Bigwoods Experimental Forest, August 26, 1948, *Woods & Moreland* BW116.

Blomquist (1934) lists 10 North Carolina counties, as do also Blomquist and Correll (1940), all in the mountain area. We know of no other collections or published records from the lower piedmont and coastal plain of this state.

Paspalum bifidum (Bertol.) Nash. Moore County: moist pocket in longleaf pine sandhills, near Manly on U. S. Rt. 1, September 15, 1949, *Godfrey* 50091.

Curtis (1867) lists this species (as *P. racemulosum* Nutt.) as occurring in North Carolina from the "Coast to Cherokee", but we know of no collections to substantiate this statement. Hitchcock (1935) does not have it extending north of South Carolina, but Fernald (Rhodora **40:** 388. 1938) has described a variety of this species based on collections made in Sussex County, Virginia.

GLYCERIA PALLIDA Trin. COLUMBUS COUNTY: edge of ditch, border of tupelo-swamp, northwest side of Lake Waccamaw, May 15, 1950, *Blomquist* 15007 (in herb. Duke).

Hitchcock (1935) gives North Carolina as the southern limit of the range of this species, and the dot on his map (p. 94) indicates the western part of the state. Curtis (1867) lists it with the annotation "UP. DIST.", meaning the mountains. However, Blomquist (1948) states that it is "found only in the Dismal Swamp section." The station cited here is in the coastal plain in the southeastern corner of the state, and represents a considerable extension from either of the regions from which it has been previously reported.

PHRAGMITES COMMUNIS Trin., var. BERLANDIERI (Fournier) Fern. CURRITUCK COUNTY: edge of *Spartina cynosuroides* community, Northwest River, near Moyock, October 17, 1948, *Blomquist and Wilson* 13384 (in herb. Duke).

This is the first record for North Carolina.

CYPERUS FLAVESCENS L., var. POAEFORMIS (Pursh) Fern. MACON COUNTY: Horse Cove Bog, near Highlands, August 19, 1949, *Godfrey and Fox* 49993.

Quarterman and Keever (1947) do not list this for the area covered by their checklist.

CYPERUS LECONTEI Torr. BRUNSWICK COUNTY: coarse sand, ditch-bank, Orton Plantation, along the river-road, n. of Southport, August 19, 1948, *Godfrey* 48395; sandy margin of Pretty Pond, July 27, 1949, *Godfrey* 49709.

According to the range given by Small (1933), these collections extend the range northward from Florida.

ELEOCHARIS ALBIDA Torr.[2] BRUNSWICK COUNTY: margin of salt marsh, Smith's Island, August 27, 1949, *Fox, Godfrey and Beaman* 3249.

Svenson (RHODORA **39:** 271–272. 1937) cites a single collection from North Carolina, one by I. F. Lewis from Beaufort.

ELEOCHARIS BALDWINII (Torr.) Chapm. BRUNSWICK COUNTY: sandy margin of Pretty Pond, July 27, 1949, *Godfrey* 49708.

Svenson (RHODORA **39:** 240–242. 1937) cites a specimen of Curtis' from Wilmington, none others north of Georgia.

[2] We are indebted to Dr. H. K. Svenson of the American Museum of Natural History for the determination of duplicates of all the specimens of *Eleocharis* cited herein.

Eleocharis flavescens (Poir.) Urban. Dare County: in shallow water, margin of freshwater-pond, behind beach-dunes, Kill Devil Hills, June 11, 1949, *Godfrey and Fox* 49271; Carteret County: in shallow water, roadside-canal, 4 miles south of Atlantic, July 14, 1949, *Godfrey, Fox and Blomquist* 49555.

On the range-map published by Svenson (Rhodora **41:** 10. 1939), there is one location-dot in North Carolina.

Eleocharis melanocarpa Torr. Brunswick County: margin of pond, near Orton Plantation, 9 miles n. of Southport, June 15, 1949, *Godfrey* 49345; sandy margin of Pretty Pond, July 27, 1949, *Godfrey* 49707.

Wood and McCarthy (1886) list this species for the Wilmington area, but Svenson (Rhodora **39:** 269–270. 1937) cites none between New Jersey and Georgia. Fernald (Rhodora **40:** 391. 1938) has reported it for one county in southeastern Virginia.

Eleocharis microcarpa Torr. Brunswick County: small cypress-pond, south of the railroad and church at Maco, just s. of U. S. Rt. 76, May 21, 1949, *Godfrey* 49188.

Svenson (Rhodora **39:** 228–230. 1937) gives South Carolina as the northernmost limit of the range for the typical variety of the species.

Eleocharis montevidensis Kunth. Currituck County: cattail-marsh, ¼ mile s. of Maple, along N. C. Rt. 158, June 10, 1949, *Godfrey & Fox* 49247.

A northward extension from South Carolina, according to range given by Svenson (Rhodora **34:** 220. 1932) for *E. arenicola* Torr., which he later reduced to synonymy.

Eleocharis parvula (R. & S.) Link. Tyrrell County: pond-margin, 1 mile w. of Columbia, June 12, 1949, *Godfrey and Fox* 49311.

Svenson (Rhodora **31:** 168–171. 1929) cites no collections from between Virginia and Georgia.

Eleocharis tricostata Torr. Brunswick County: burned-over wiregrass savanna, just n. of Southport, along N. C. Rt. 303, May 21, 1949, *Godfrey* 49173; sandy pond-margin, well above water's edge, Marsh Branch, along river-road n. of Southport, June 15, 1949, *Godfrey* 49351; Bladen County: shallow cypress-pond, ⅖ mile e. of Elizabethtown, July 9, 1949, *Godfrey and Fox* 49489.

Svenson (Rhodora **34:** 219. 1932) cites no specimens from between New Jersey and Georgia, but Fernald (Rhodora **49:** 124. 1947) has reported it for southeastern Virginia.

Eleocharis vivipara Link. Brunswick County: sandy and peaty pond-margin, ½ mile n. of Calabash, July 29, 1949, *Godfrey and Fox* 49729; Cumberland County: in shallow water at the edge of Elder Lake, s. of Fayetteville, along N. C. Rt. 87, June 26, 1949, *Godfrey and Fox* 49357; Dare County: in shallow water, margin of freshwater-pond, behind beach-dunes, Kill Devil Hills, June 11, 1949, *Godfrey and Fox* 49279.

Svenson (Rhodora **39:** 242–243. 1937) cites only one specimen from North Carolina, one of Curtis' from Wilmington.

Bulbostylis coarctatus (Ell.) Fern. Brunswick County: scattered tufts in open white sand areas, about 1 mile n. of Southport, August 27, 1949, *Fox and Beaman* 3253; Carteret County: scrub-oak sand-ridges, Harker's Island, July 15, 1949, *Godfrey, Fox and Blomquist* 49583; New Hanover County: sandhills near Wilmington, October 2, 1908, *E. B. Bartram* (in Gray Herb.).

Small (1933) gives the range of this species (as *Stenophyllus coarctatus* (Ell.) Britton) as extending northward to South Carolina, but Fernald (Rhodora **43:** 538. 1941) reported it for Virginia, as an "extension north from North Carolina," probably as a result of having seen the last collection listed above.

Rhynchospora capitellata (Michx.) Vahl. Macon County: abundant in Horse Cove Bog near Highlands, August 19, 1949, *Godfrey and Fox* 49990.

This collection is included because this species is not in the check-list for the Highlands area by Quarterman and Keever (1947).

Rhynchospora divergens Chapm. Brunswick County: very abundant in burned-over wire-grass savanna, just n. of Southport, July 26, 1949, *Godfrey* 49702.

Fox and Godfrey (1949) extended the range of this species northward from South Carolina, reporting it for two counties in North Carolina: Carteret and Columbus.

Rhynchospora perplexa Britton. Brunswick County: margin of small cypress-pond, Marsh Branch, on the river-road n. of Southport, June 15, 1949, *Godfrey* 49349; Bladen County: abundant in a shallow borrow-pit pool between the highway and

railroad, 19 miles n.w. of Elizabethtown, July 9, 1949, *Godfrey and Fox* 49479; CARTERET COUNTY: abundant in peaty soil around the margin of a large cypress-pond, e. of Newport, August 8, 1949, *Godfrey* 49847; ONSLOW COUNTY: abundant in a shallow pond, 3 miles w. of Swansboro, July 16, 1949, *Godfrey & Fox* 49598; EDGECOMBE COUNTY: abundant in a small gum-depression between Whitakers and Enfield, July 22, 1949, *Godfrey & Fox* 49643.

Previously known from two North Carolina counties (according to Gale, 1944, and Fox and Godfrey, 1949), a fairly common occurrence in the coastal plain of this state is indicated by these additional records.

RHYNCHOSPORA WRIGHTIANA Boechl. CARTERET COUNTY: savanna, ½ mile n. of Smyrna, along U. S. Rt. 70, July 14, 1949, *Godfrey, Fox and Blomquist* 49551; savanna, near the Sound View Church, w. of Morehead City, along N. C. Rt. 24, August 6, 1949, *Godfrey* 49838.

Gale (1944) cites one North Carolia locality, in Brunswick County.

SCLERIA MINOR (Britton) W. Stone. MACON COUNTY: Horse Cove Bog, near Highlands, August 18, 1949, *Godfrey and Fox* 49991.

This collection is listed since it is not in the checklist for the Highlands region by Quarterman and Keever (1947).

CAREX AGGREGATA Mackenzie. DURHAM COUNTY: east side of residence, 922 Demerius Street, Durham, May 20, 1944, *Blomquist* 13468 (in herb. Duke).

Mackenzie (1940) gives New Jersey & the District of Columbia as the southern limit of range for this species. This is the first report for North Carolina.

CAREX ARENARIA L. NEW HANOVER COUNTY: in beach-sand, Ft. Fisher, March 31, 1938, *Blomquist* 10227 (in herb. Duke).

Mackenzie (1940) gives for the east coast only "Sea Beaches, Virginia" for this species, which he says is "adventive from Europe." Fernald (RHODORA **38:** 381 and 399. 1936), however, reporting it for Northampton County, Virginia, expresses the view that there it appears "in every way like an indigenous element of the vegetation; seeming to us like a relic on our coast comparable with many limited colonies from New England to Newfoundland of species which abound in western Europe."

The above station has probably now been destroyed by the removal of this portion of the shore by wave-action, since Blomquist on a recent visit to the area failed to locate any of the plants.

CAREX EXILIS Dewey. MOORE COUNTY: seepage-bog in branch-bay, 3 miles w. of Southern Pines, April 24, 1949, *Godfrey, Fox, F. & S. Woods* 49152.

Mackenzie (1940) gives the range as extending as far south as Delaware. A duplicate of this collection was identified by F. J. Hermann of the Bureau of Plant Industry, Beltsville, Maryland.

CAREX NIGROMARGINATA Schwein., var. FLORIDANA (Schwein.) Kükenth. BRUNSWICK COUNTY: in woods-mold in a grove of laurel- and live-oaks on bluff overlooking Cape Fear River at Southport, March 19, 1949, *Godfrey* 49005; in scrub live-oak thickets, old dunes, Long Beach, March 21, 1950, *Godfrey & Fox* 50304.

Mackenzie (1940) gives the range as "Ga. to Fla. to Texas" but Fernald (RHODORA **44:** 385–386. 1942) validates earlier reports for Elizabeth City Co., Va. and Horry Co., S. C. This report of our collections constitutes the first records for this plant in North Carolina.

CAREX FOENEA Willd. ASHE COUNTY: in clearing at the fire-tower, summit of Nigger Mt., September 7, 1949, *Godfrey & Fox* 50231.

Mackenzie (1940) gives Virginia as the southern limit of the range of this sedge. Curtis (1835) and Wood and McCarthy (1886) had listed it for the Wilmington area, but since this was apparently disregarded by Mackenzie, we are regarding this enumeration as the first authentic report for North Carolina.

CAREX JOORI L. H. Bailey. HERTFORD COUNTY: swampy woods, Big Woods Experimental Forest, e. of Como, October 24, 1948, *Fox, Boyce & Moreland* 2119; SAMPSON COUNTY: low ground under bridge, e. bank of South R., 2 miles w. of Kerr, October 29, 1948, *Fox and Godfrey* 2150.

Mackenzie (1940) gives the range as extending as far north as Maryland, but as far as we can determine, this species has not been reported for North Carolina.

SPIRODELA POLYRHIZA (L.) Schleid. WAKE COUNTY: Marshburn's Pond, June 1, 1947, *Whitford;* small sunny farm-pond, on U. S. Rt. 1, 6 miles north of Raleigh, June 26, 1947, *Fox & Whitford;* Nowell Pond, off U. S. Rt. 64, 1 mile w. of Wendell,

May 18, 1950, *Whitford;* Robertson's Pond, off U. S. Rt. 64, 10 miles e. of Raleigh, May 19, 1950, *Whitford.*

These collections are cited here because this species is not included in the piedmont flora by Blomquist and Oosting (1948).

Lemna minor L. Wake County: pond, 1 mile s. of Eagle Rock, May 19, 1950, *Whitford;* Robertson's Pond off U. S. Rt. 64, 10 miles e. of Raleigh, May 19, 1950, *Whitford.*

Blomquist and Oosting (1948) do not include this species.

Luzula acuminata Raf., var. carolinae (Wats.) Fern. Pender County: beech-woods on bluff, Washington Creek between Wallace and Burgaw, March 20, 1950, *Godfrey & Fox* 50307; Nash County: wooded ravine along Turkey Creek near Middlesex, April 4, 1939, *Godfrey & White* 7013 (in Gray Herb.).

Small (1933) gives the range (as *L. carolinae* Wats.) as "Blue Ridge, N. C. and Tenn.," but we have seen several specimens from the lower piedmont. The Pender County collection extends the known range into the lower coastal plain of North Carolina. There are, however, many specimens in the Gray Herbarium from southeastern Virginia.

Uvularia pudica (Walt.) Fern. Wake County: scattered plants intermixed with a thick ground-cover of *Galax* on a steep, north-facing bluff, "The Hemlocks," west of Cary about 4 miles, April 3, 1949, *Godfrey* 49016; Raleigh, 1838 (in herb. NYBG—ex herb. Princeton University, 1945); Lincoln County: pine-woods, along N. C. Rt. 150, 6 miles east of Lincolnton, April 17, 1949, *Godfrey, Fox and Woods* 49107; Onslow County: sandy ridge, camp-site, Cowhorn Creek, Hofmann Forest, April 15, 1948, *Boyce;* Pender County: near Big Savanna, April 9, 1925, *Wells.*

Blomquist and Oosting (1948) do not include this plant; two of the above-listed stations are definitely in the piedmont. At "The Hemlocks" station both *U. perfoliata* L. and *U. sessilifolia* L. were also abundant on the floodplain at the base of the bluff. Dried specimens of the latter and *U. pudica* are easily confused, especially when made from immature plants in the flowering condition. In the field, however, they are at the time of flowering readily distinguishable in that plants of *U. pudica* occur singly and have clear, pale cream-yellow flowers while those of *U. sessilifolia* are rhizomatous, forming extensive clones, the flowers being a pale and lined straw-yellow.

TRILLIUM PUSILLUM Michx. WAKE COUNTY: alluvial flat, head of Yates' Pond, about 5 miles s. of Raleigh, April 20, 1950, *Fox & Adams* 3561.

Curtis (1867) lists this species for the "LOW. DIST." Peattie (1927) and Small (1933) give ranges for it as including the coastal plain of North Carolina. Barksdale (1938) cited only one station in this state, in Haywood County, this being based on a collection by Harbison. Dr. S. J. Smith of the New York State Museum, Albany, verified our determination. There is a Curtis collection from North Carolina, without locality, in the Herbarium of the New York Botanical Garden.

COMPTONIA PEREGRINA (L.) Coulter. LEE COUNTY: turkey-oak sandhills, near U. S. Rt. 1, 7 miles south of Sanford, August 11, 1949, *Fox* 2884; HARNETT COUNTY: near fire-tower, south-eastern part of county, June 17, 1927, *B. W. Wells;* CUMBERLAND COUNTY: Ft. Bragg Reservation, Monroe Hill, 5 miles west of Ft. Bragg, elev. 440 ft., June 20, 1937, *H. R. Totten* (in herb. U. N. C.); WAKE COUNTY: in open woodland, summit of north-facing bluff, Crabtree Creek, n.w. of Raleigh, May 24, 1950, *Godfrey* 50389.

Curtis (1860) states that this species "is occasionally found in dry and sandy woods in the upper part of the Lower (District)" but, judging from known collections, it seems to be very uncommon except in the mountainous part of the state.

FROELICHIA FLORIDANA (Nutt.) Moq. HARNETT COUNTY: sandy road-bank and edge of corn-field, on U. S. Rt. 15A, 4 miles north of Kipling, October 5, 1949, *Fox* 3493; dry, sandy field, 2.7 miles west of Lillington on U. S. Rt. 421, October 5, 1940, *Radford and Stewart* 615.

This adventive species was first reported for North Carolina by Fox and Godfrey (1949), from three North Carolina counties, all in the coastal plain.

ISOPYRUM BITERNATUM (Raf.) T. & G. DURHAM COUNTY: on narrow floodplain just east of big bluff near Mr. Duke's farm, about 4 miles n.e. of Durham, March 26, 1950, *Blomquist* 14833.

Small (1933) gives the range as "west of Appalachians, W. Fla. to Tex., Minn., and S. Ont." The only report for North Carolina of which we are aware is that of D. M. Brown for Roan Mountain, Mitchell County (Ecol. Monog. **11:** 61–97. 1941), but the specimen in the Duke University Herbarium upon which

Brown presumably based his report is *Anemonella thalictroides* (L.) Spach.

Argemone alba Lestib. Brunswick County: Southport, August 10, 1930, *Blomquist* 3712; Southport, May 1, 1935, *Andy Matthews* (in herb. U. N. C.); common in vacant lots, weed-borders, and along the streets, Southport, May 13, 1950, *Godfrey and Wiebe* 50378; Carteret County: roadside, northeast of Beaufort, June 21, 1941, *Madeline Hill* 37 (in herb. Duke); Bladen County: dry, sandy soil, field, 7 miles north of Elizabethtown, May 11, 1941, *Radford & Stewart* 1053 (in herb. U. N. C.).

According to the range given by Small (1933), these collections represent an extension northward from South Carolina.

Sarracenia rubra Walter. Onslow County: longleaf pine savanna, near U. S. Rt. 1, 6 miles south of Verona, August 26, 1949, *Fox* 3225; Harnett County: margin of shrub-bog, Spout Springs, June 20, 1927, *Wells;* Pender County: "Big Savanna" (near Burgaw), July 2, 1924, *Wells;* Columbus County: 1884, *G. McCarthy* (in herb. N. Y. B. G.); Henderson County: Flat Rock (in herb. N. Y. B. G.—ex herb. Princeton University, 1945); Eastern North Carolina, 1884, *G. McCarthy* (in herb. N. Y. B. G.); Oriente Carolina Septentrionalis, July, 1885, *G. McCarthy* (in herb. N. Y. B. G.).

Bell (Jour. Elisha Mitchell Soc., **65:** 150. 1949) records two counties for this species in North Carolina: viz., Moore and Brunswick. Dr. D. S. Correll informs us that there are specimens in the U. S. National Herbarium from New Hanover and Columbus Counties. These additional records indicate a more frequent occurrence for it and extend the known range somewhat northward.

Hydrangea arborescens L. Craven County: mesic woods, bluff on Neuse River above Flanner Beach, July 14, 1949, *Fox and Godfrey* 2669.

We have seen no reports of this species from the coastal plain of this state and but one other collection from that physiographic province, one by H. R. Totten from Cumberland Co. (in herb. U. N. C.).

Prunus umbellata Ell. Brunswick County: roadside-thicket, 1 mile w. of Village Point, July 29, 1949, *Fox & Godfrey* 2824.

According to Coker and Totten (1945) this plum is known from North Carolina only in and near the basin of the Pee Dee River. However, they cite it for the neighborhood of Myrtle Beach, S. C., which is in the county bordering the one cited above. A duplicate of our collection was identified by Dr. Rogers McVaugh, University of Michigan.

Polygala Curtissii Gray. Macon County: abundant in Horse Cove Bog, near Highlands, August 19, 1949, *Godfrey & Fox* 49994.

Included here because it is not in the checklist for the Highlands region by Quarterman and Keever (1947).

Sebastiania ligustrina (Michx.) Muell.-Arg. Robeson County: abundant along river-margin, Lumber River swamp below N. C. Rt. 74 bridge, 3 miles n.w. of Lumberton, June 27, 1949, *Fox & Godfrey;* Columbus County: swamp of Lumber River near Boardman, July 2, 1934, *H. A. Rankin* (in herb. U. N. C.); bank of Lumber River, May 8, 1921, *J. S. Holmes* (in herb. U. N. C.).

This shrub is listed by Curtis (1860 & 1867) for the "Low. Dist." and by Wood and McCarthy (1886) for the Wilmington area, in these lists on the authority of Dr. J. F. McRee. Small (1933) gives the range as extending into North Carolina. However, the only collections from the state besides the above of which we are aware are the following, both in the Herbarium of the New York Botanical Garden: one from "Wilmington," by McRee and one from "near Fayetteville, July, 1934," by H. A. Rankin.

Rhus Vernix L. Wake County: marshy ground, Smallwood estate, Raleigh, May 12, 1948, *Fox* 1434; swampy hollow, east side of Brooks Ave., 900 block, Raleigh, July 6, 1950, *Fox* 3806.

Coker and Totten (1945) state that "we have never found it in the piedmont section of North Carolina," and Blomquist & Oosting (1948) do not include it. The first listed station, where the species was abundant, has now been destroyed by a housing development.

Cyrilla racemiflora L. Moore County: creek-bank, on N. C. Rt. 22, ½ mile s. of High Falls, July 5, 1949, *Fox* 2539.

Coker & Totten (1945) give the range of this coastal plain species as far inland as Wake and Lee Counties. The above

locality seems to be the westernmost known in North Carolina, definitely in the piedmont province.

Sida inflexa Fern. Wake County: thin soil on rock, near old mill-dam on Neuse River, Milburnie, August 4, 1948, *Fox & Whitford* 1801.

This species was described by Fernald (Rhodora **42:** 463–464. 1940) and its relationship with and differences from *S. Elliottii* T. & G. were discussed. The latter has been reported for North Carolina, Curtis (1867) and Wood and McCarthy (1886), but according to Fernald, who states that his new species has been passing for that entity, *S. Elliottii* is not known from north of southeastern South Carolina. Our specimens fit Fernald's description of *S. inflexa* and, judging from his citation of specimens, this report is the first for North Carolina.

Hibiscus aculeatus Walt. Carteret County: very abundant on the bank between road and drainage-canal e. of Newport, August 4, 1949, *Godfrey and Blomquist* 49800; New Hanover County: sand-ridge, Carolina Beach, August 7, 1938, *Godfrey* 5901; Wilmington (without further data) (in herb. N. Y. B. G.—ex herb. Princeton University, 1945).

Though it was listed by Wood and McCarthy (1886) and by Curtis (1835) (as *H. scaber*) with the annotation "Brunswick County," Small (1933) extends it northward only to South Carolina in the coastal plain.

Hibiscus palustris L. (sensu Fernald in Rhodora **44:** 269. 1942). Nash County: boggy swale, on U. S. Rt. 301, 5 miles n. of Rocky Mount, July 22, 1949, *Fox & Godfrey* 2736; Craven County: in black-muck soil, roadside-ditch, 1 mile n. of Epworth Church on N. C. Rt. 118, June 3, 1950, *Whitford*.

Two previously known stations for North Carolina were published by Fox and Godfrey (1949).

Helianthemum corymbosum Michx. Carteret County: sandy clearing, Lennox Point, e. of Beaufort, July 15, 1949, *Fox & Godfrey* 2695; near edge of water, east end of Harker's Island, May 23, 1941, *Radford and Stewart* 1172 (in herb. U.N.C.).

Curtis (1835) and Wood & McCarthy (1886) list this species for the Wilmington area, but Small (1933) gives coastal plain of South Carolina as the northernmost limit. There is a specimen in the Herbarium of the New York Botanical Garden, with name *Cistus corymbosus*, labelled simply "Wilmington."

LECHEA PATULA Leggett. BRUNSWICK COUNTY: in coarse sand of plowed fire-lane in longleaf pine barren, Orton Plantation, 10 miles n. of Southport, September 12, 1941, *Godfrey* (*Plantae Exsiccatae Grayanae* 1161); MOORE COUNTY: sandhill old field, near Manly along U. S. Rt. 1, September 15, 1949, *Godfrey* 50086.

In Hodgdon's monograph (RHODORA **40:** 62–63. 1938) there are no collections cited from north of South Carolina, and Dr. Hodgdon, who identified both of these collections, informs us that he has seen no others from North Carolina.

LILAEOPSIS CAROLINENSIS Coulter & Rose. DARE COUNTY: Manteo, July 6, 1923, *B. W. Wells.*

According to Fernald (RHODORA **42:** 371. 1940) this species was described from a "single collection from North Carolina (presumably near Wilmington)" and on p. 470 (*loc. cit.*), he lists his collection from Princess Anne Co., Va., as representing the fourth known station in North America. Dr. D. S. Correll informs us that there is a specimen in the U. S. National Herbarium collected by Gerald McCarthy in New Hanover County.

TORILIS NODOSA (L.) Gaertn. CARTERET COUNTY: edge of street, near Holden's Cafe, Beaufort, May 14, 1950, *Blomquist & Batson* 14975.

Mathias and Constance (N. A. Flora **28B** (1): 110. 1944) state that it is "adventive throughout the southern United States," but we have seen no collections or records of collections from North Carolina.

DAUCUS PUSILLUS Michx. PENDER COUNTY: Rocky Point, May 21, 1925, *A. C. Martin;* BRUNSWICK COUNTY: abundant in roadside-borders along N. C. Rt. 303 north of Southport, May 21, 1949, *Godfrey* 49160.

Mathias and Constance (N. A. Flora **28B** (1): 113. 1944) give South Carolina as the northern limit of range on the east coast. Small (1933) had listed Florida as the eastern limit. It is well established in and around Southport and apparently has been for a long time, inasmuch as Curtis (1835) and Wood and McCarthy (1886) list it for "Smithville," the old name for Southport.

CYNOCTONUM SESSILIFOLIUM (Walt.) Gmel. NASH COUNTY: low savanna, 1 mile e. of Middlesex, Rt. 264, July 30, 1935, *Blomquist* 7574 (in herb. Duke); CRAVEN COUNTY: October, *O. M. Freeman* (in Nat. Arb. Herb.); CARTERET COUNTY: edge of road through savanna, along Rt. 70 between Beaufort and

Atlantic, August 8, 1940, *Blomquist* 11281 (in herb. Duke); savanna east of Newport, August 7, 1949, *Godfrey & Blomquist* 49853; Columbus County: Bug Hill, low pine woods, August 26, 1927, *Schallert* 9450 (in herb. Duke); savanna, northwest of Waccamaw River, along N. C. Rt. 130, August 9, 1949, *Godfrey & Blomquist* 49873; Brunswick County: savanna, 5.5 miles n. of Bishops, July 31, 1949, *Godfrey & Fox* 49747; New Hanover County (presumably; not given on label): prope Wilmington, October, 1867, *Canby* (in herb. N. Y. B. G.—ex herb. Princeton University, 1945).

Small (1933) gives the range as "Coastal Plain, Fla. to La.," but Fernald (Rhodora **45:** 457. 1943) reported it for Brunswick County, Virginia. Alexander (Castanea **5:** 92. 1940) first recorded it for North Carolina, from New Hanover County.

Breweria angustifolia Nash.[3] Carteret County: wiregrass, turkey-oak sandhill, along N. C. Rt. 25 at the junction with the Newport road west of Morehead City, July 16, 1949, *Godfrey and Fox* 49596; savanna at edge of pocosin 1½ miles n. of Newport, U. S. 70, July 23, 1946, *Hollis Rogers* 3145 (in herb. Duke); Onslow County: dry sandy soil, Dixon, July 21, 1922, *L. F. & Fannie R. Randolph* 962 (in Gray Herb.); Cumberland County: roadside, sandy soil, near U. S. Rt. 301, at Rockfish Creek, s. of Fayetteville, June 26, 1949, *Fox and Godfrey* 2401; Bladen County: coarse white sand, scrub-oak and longleaf pine sand-ridge, just northwest of White Lake near the Prison Camp, July 9, 1949, *Godfrey and Fox* 49497; in sand near lake, White Lake, July 15, 1935, *Correll* 2578 (in Nat. Arb. Herb.); Scotland County: sandhill, 12 miles n. of Laurinburg, July 14, 1938, *Godfrey* 5047 (in Gray Herb.); turkey-oak sandhills, six miles n. of Laurinburg, June 27, 1949, *Fox & Godfrey* 2415; Brunswick County: Southport, July 8, 1897, *Biltmore Herb.* 1665a (in Gray Herb.); sand-ridge, turkey-oak, longleaf pine, ½ mile east of Seaside, July 29, 1949, *Godfrey and Fox* 49727; Johnston County: sandy land at home of B. E. Smith, September 4, 1932, *B. E. Smith* (in herb. U. N. C.).

Breweria aquatica (Walt.) Gray. Wilson County: weedy bank, near U. S. Rt. 264, 0.7 mile w. of Sims, August 25, 1949,

[3] Fernald and Schubert (Rhodora **51:** 35–43. 1949) clarified the identities in our eastern *Breweria;* during their study they requested that we send our material to them, but we were much embarrassed that we had scarcely any to send. During the 1949 season, therefore, we made a considerable number of collections in eastern North Carolina. Prof. Fernald and Dr. Schubert very kindly examined our series and furnished us with their determinations, and Prof. Fernald generously supplied us, in addition, with citations of all of the North Carolina material in the Gray Herbarium. In order to indicate rather positively what our identities in *Breweria* are, as we now know them, we are citing below both the specimens at the Gray Herbarium, those at Duke University and the University of North Carolina, and our own recent collections.

Fox 3157; WAYNE COUNTY: sandy ridge, 5 miles north of Seven Springs, July 16, 1949, *Godfrey and Fox* 49610; WAKE COUNTY: sandy ridge, near the Wake-Harnett County line, 3 miles s.w. of Fuquay Springs on the Duncan Road, July 8, 1949, *Godfrey and Fox* 49404; MOORE COUNTY: dry open pine-woods, 2 miles south of Pinebluff, July 1, 1927, *Wiegand and Manning* 2631 (in Gray Herb.); sandy soil, July 4, 1940, *Grace J. Schallert* (in Gray Herb.); turkey-oak sandhills, near U. S. Rt. 1, 4.7 miles s. of Aberdeen, August 11, 1949, *Fox* 2893; turkey-oak sandhills, 0.8 mi. e. of Lakeview, August 11, 1949, *Fox* 2891; ANSON COUNTY: turkey-oak sandhills remnant, near Sandy Plains Church, 1 mile w. of N. C. Rt. 87, southern part of county, August 11, 1949, *Fox* 2917; NEW HANOVER COUNTY: sand-ridge at Carolina Beach, June 28, 1938, *Godfrey* 4705 (in Gray Herb.); BRUNSWICK COUNTY: C. C. C. Camp, Southport, July 30, 1935, *A. C. Mathews* (in herb. U. N. C.); sand-ridge, turkey-oak and longleaf pine, along Cape Fear River just above Southport, July 27, 1949, *Godfrey* 49719; sand-ridge, near the church at Maco, July 21, 1949, *Godfrey and Fox* 49752; pineland, north of Southport, sandy soil, open thickets, near Coates, July 7, 1942, *Blomquist* 13302 (in herb. Duke); SAMPSON COUNTY: wire-grass sandhills, 5 miles west of Clinton, June 11, 1938, *Godfrey* (in herb. Duke); CUMBERLAND COUNTY: sandy soil with pines and turkey-oaks, by Fayetteville-Sanford road, Ft. Bragg Reservation, July 21, 1929, *H. R. Totten* (in herb. U. N. C.); RICHMOND COUNTY: turkey-oak sandhills, on U. S. Rt. 1, 2½ miles n.e. of Rockingham, June 8, 1950, *Fox* 3656; County not indicated: Photo of type of *Convolvulus patens* Desr., e. Carolina, *Fraser* (in Gray Herb.).

BREWERIA HUMISTRATA (Walt.) Gray. HERTFORD COUNTY: pineland, 4 miles w. of Winton, July 18, 1938, *Godfrey* 5229 (in Gray Herb.); HALIFAX COUNTY: pineland, 4 miles w. of Winton, August 18, 1938, *Godfrey* (in herb. Duke); GREENE COUNTY: dry sandy soil, waste ground, Snow Hill, July 8, 1922, *Randolph & Randolph* 760 (in Gray Herb.); LENOIR COUNTY: in low grounds of Neuse River, Kinston, August 8, 1931, *H. R. Totten* (in herb. U. N. C.); HARNETT COUNTY: in an open pine-woods on a slope above Avent's Creek, about 5 miles west of Kipling, July 8, 1949, *Godfrey and Fox* 49427; PAMLICO COUNTY: roadside, Arapahoe, July 10, 1933, Oosting (in herb. Duke); PENDER COUNTY: Burgaw, June 26, 1945, *Wells;* NEW HANOVER COUNTY: Wilmington, *M. A. Curtis* (in Gray Herb.); sandhills, Carolina Beach, July 7, 1940, *Wells;* BRUNSWICK COUNTY: dry pine-woods, 3 miles e. of Leland, July 5, 1927, *Wiegand and Manning* 2634 (in Gray Herb.); SAMPSON COUNTY: dry open sandy soil along Black River, near Tomahawk, June 20, 1935, *Correll* 1285 (in herb. Duke); CLEVELAND COUNTY: sandy bank of Broad River, near Rt. 150, 4 miles s. of Boiling Springs, August 5, 1947, *Fox* 672;

Dare County: in tall pine-woods, very dry, about ¼ mile s. of Ft. Raleigh, Roanoke Island, September 21, 1940, *Radford & Stewart* 830 (in herb. U. N. C.).

Breweria Michauxii Fern. & Schubert. Columbus County: abundant in an extensive wire-grass savanna, n.w. of Waccamaw River, along N. C. Rt. 130, August 9, 1949, *Godfrey and Blomquist* 49868; Brunswick County: abundant in wire-grass savanna, near the church at Maco, July 31, 1949, *Godfrey and Fox* 49750.

Prof. Fernald tells us that there were no specimens of this entity in the Gray Herbarium from north of Georgia.

Breweria Pickeringii (Torr.) Gray. New Hanover County: sandhills between the Cape Fear and Northeast Cape Fear Rivers, north of Wilmington, *Godfrey, Wells and Beaman* 50032, August 25, 1949.

Typical *Breweria Pickeringii* has been known only from the type-collection (see Fernald and Schubert, 1949) from dry sand, Wilmington, N. C. This, then, constitutes rediscovery of the plant in its type-locality after the lapse of 116 years. It is listed by Woods & McCarthy (1886).

Polemonium reptans L. Stokes County: bank of Town Fork Creek, just s. of Walnut Cove, April 23, 1950, *Fox, Godfrey & Blomquist* 3562.

The range given by Small (1933) includes North Carolina, but we have seen no collections and only one record for the state, that of Curtis (1867), for Haywood County. It is not included by Blomquist and Oosting (1948) for the piedmont region, in which physiographic province the above cited station is located.

Solanum gracile Link. Pender County: depression behind road in beach-dunes, 1 mile n. of New Topsail Beach, July 1, 1950, *Fox & Boyce* 3732; Carteret County: depression between sand-dunes, west of Salter Path on Bogue Bank, July 15, 1949, *Fox, Godfrey and Blomquist* 2689; Hyde County: Ocracoke Island, June 23, 1938, *Wells and Shelbourne* 4766 (in U. S. Nat. Herb.).

This species was apparently first recorded for this state by Lewis (1917) from Shackleford Bank, Carteret County. Small (1933) extends the range into the state "near the coast," but as far as we have been able to determine, there are no other records for North Carolina.

SALPICHROA RHOMBOIDEA Miers (*Perizoma rhomboidea* (Hook.) Small.) CARTERET COUNTY: roadside near sound, Morehead City, May 3, 1941, *Whitford;* by Beaufort Channel, Beaufort, July 25, 1946, *Rogers & Blomquist* 3186 (in herb. Duke); abundant on the waterfront in Morehead City, August 3, 1949, *Godfrey* 49770.

Small (1933) gives only "waste places, Fla." for this South American plant. It is apparently well established in Beaufort and Morehead City.

BUCHNERA FLORIDANA Gandoger. WAKE COUNTY: railroad savanna, just east of Durham-Wake County line, north of Morrisville, along U. S. Rt. 70A, July 13, 1949, *Godfrey* 49516.

Small (1933) gives a range which includes only the coastal plain of North Carolina, and Blomquist and Oosting (1948) do not include this species as a part of the piedmont flora. The above locality is definitely in the lower piedmont.

PEDICULARIS CANADENSIS L. ONSLOW COUNTY: part-time swamp, near Comfort fire-tower, Hofmann Forest, April 5, 1948, *Boyce & Woods* 606; COLUMBUS COUNTY: locally abundant in burned, disturbed savanna, near Old Dock, May 13, 1950, *Godfrey & Wiebe* 50371; JOHNSTON COUNTY: marsh, near Princeton, April 16, 1936, *Gladys E. Mitchell* (in herb. Duke).

Curtis (1867) puts this species in "All the Districts," and Croom (1837) lists it for New Bern, but since the above-listed collections are the only ones we have seen from the coastal plain, we feel it worthwhile to list them.

JUSTICIA OVATA (Walt.) Lindau (*J. humilis* Michx.). COLUMBUS COUNTY: drainage-ditch, east of Hallsboro, July 4, 1927, *Wiegand & Manning* 2917 (in Gray Herb.); edge of swamp, moist soil, northwest side of Lake Waccamaw, May 15, 1950, *Blomquist* 15006 (in herb. Duke); NEW HANOVER COUNTY: Wilmington, *M. A. Curtis* (in Gray Herb.); PENDER COUNTY: June 7–12, 1899, *W. W. Ashe* (in herb. U. N. C.); ONSLOW COUNTY: low, swampy ground on Southwest Creek, near U. S. Rt. 17, 4½ miles s. of Jacksonville, June 30, 1950, *Fox & Boyce* 3719; CRAVEN COUNTY: palmetto-swamp near Vanceboro, July 28, 1923, *E. J. Alexander* (in herb. U. N. C.); GREENE COUNTY: swamp bordering stream, July 8, 1922, *L. F. & Fannie R. Randolph* 706 (in Gray Herb.); in woods, river bottom along the Contentnea River, near Snow Hill, June 21, 1935, *Correll* 1334 (in Nat. Arb. Herb.).

Small (1933) gives the range as "Fla. to Texas and Va." Croom & Loomis (1833) and Croom (1837) list it for the New Bern area, Curtis (1835) for Wilmington, and Curtis (1867) lists it for "LOW. DIST." (as *Dianthera ovata* Walt.), but due to the paucity of collections from North Carolina in the herbaria in the state and to the lack of modern published records for the state, we feel it worthwhile to record the above collections here.

Phryma Leptostachya L. Craven County: wooded bluff, Flanner Beach, on Neuse River, 10 miles below New Bern, July 14, 1949, *Godfrey & Fox* 49544.

This is the only collection from the North Carolina coastal plain of which we are aware. Fernald (Rhodora **37:** 442–443. 1935) has described a variety of this species, var. *confertifolia*, which differs in having the internodes shortened so that the leaves appear subverticillate and in having less pubescent stems and blunter leaf-tips. He says that no typical *P. Leptostachya* was seen on the coastal plain of Virginia.[4] Plants of our collection have no internodes less than 2 cm. long, some were 8–11 cm. long, and we can see no substantial difference in pubescence and leaf apex between our specimens and several collections from the piedmont region.

Galium uniflorum Michx. Hertford County: pine-woods, Bigwoods Experimental Forest, August 26, 1948, *Moreland and Woods* BW117.

The range given by Small (1933) is "Fla. to Tex. and S. C." This species was reported for Princess Anne Co., Va., by Fernald (Rhodora **37:** 446. 1935), extending its range from South Carolina, but this is apparently the first report for North Carolina. There are several collections from southeastern Virginia in the Gray Herbarium.

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[4]Before his death Professor Fernald had informed us that subsequently typical *Phryma Leptostachya* was found in three counties on the coastal plain of southeastern Virginia.

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WHY SO MANY CARELESS BOOKS ON TREES AND OTHER PLANTS?

M. L. Fernald

Everyone is interested in trees. The poet and sentimental writer adore them; but we do not expect precision from them, and their ebullitions should not be looked upon either as science or as factual. Science aims, at least, at the truth and its unravelling, and the student of so-called applied science professes to have a similar standard, tempered by the practical. I have more than once risked my peace of mind by publishing criticisms of some of the books on trees or other plants, and have been very obviously disliked by the authors for so doing. But still the trees are a tempting subject, both for those who admit that, for dramatic effect, they alter the facts, and by others who seem to be stating facts but who, obviously, have done altogether too little verification from the more exact and less spectacular sources which are available.

The special volume which has just come to hand and which is bound to puzzle those who have a fuller knowledge of the ranges of our trees, is a very attractive book with abundant and mostly well executed drawings of distinctive parts of our trees, and abundant and too often misleading maps of their supposed ranges. This is *North American Trees* by Richard J. Preston.[1] As said, the illustrations are mostly to be praised, some by artists specially employed for this work, some borrowed from other publications. My trouble is chiefly with the maps. The first map in the book, "*Forest Regions and principal types of Forest in the United States,*" at once makes some of us gasp. As one born in the "Pine-tree State," named for the White Pine, *Pinus Strobus*, for two centuries and more considered the most important timber-tree of New England, New York and adjacent Canada, it comes as a shock to see among the "*Principal types of forest*" that the "White, red and jack pine" "type" is restricted to northern Minnesota and areas in Wisconsin and Michigan. In New England and eastern Canada *Pinus Strobus* is a tree usually of

[1] Richard J. Preston. North American Trees. 371 + lv pp., 160 plates. Iowa State College Press.

good soil, *P. resinosa* of dry and siliceous soil, and *P. Banksiana* (Jack-Pine) of the most hopelessly barren soil. There they rarely if ever mingle. The map (p. 8) showing EASTERN WHITE PINE, indicates it as extending across the area where it was so long considered the only timber tree of value. Newfoundland is left blank, but could have been dotted.

It is the maps of ranges of many of the individual species which will cause the local and competent authorities on special states or adjacent provinces to wonder. Passing the Spruces and the Larches for the moment, we will start with the BALSAM-FIR, *Abies balsamea.* All New England and New York (including Long Island) are dotted, but if the Fir occurs in southeastern New York south of the higher Catskill Mts., on Long Island, in southern or eastern Massachusetts (except in the northeastern corner of the state), it must have been planted.

Similarly, the NORTHERN WHITE CEDAR, *Thuja occidentalis*, is shown as covering all Pennsylvania, New Jersey, New England and Nova Scotia. In 1919, however, in a somewhat detailed study[2], of the occurrence of that species, I wrote:

"In Massachusetts *Thuja occidentalis* is confined to the calcareous upper Connecticut Valley and to the Stockbridge limestone region of Berkshire County.

"In Connecticut it is indigenous only in the limestone region of northern Litchfield county: 'Canaan, on a limestone ridge and in a near-by swamp (C. K. Averill), Salisbury, rocky hillside and at another locality in a deep swamp (Mrs. C. S. Phelps).'

"In southern New York *Thuja occidentalis* was formerly known on the lower Hudson: 'At Verplanck's Point . . . on . . . fine bluffs of palacozoic limestone,' where it was associated with other calcicoles, *Anemone canadense, Arenaria stricta, Arabis lyrata*, etc.; and at other stations lower down the Hudson (now presumably extinct).

"In New Jersey the only authentic records are from the lower Hudson, the old records from farther west, having been doubted. In other words, in Connecticut and southeastern New York and adjacent New Jersey *Thuja occidentalis* occurs only in the localities indicated so clearly on Dana's map of limestone areas of the region (including the Palisade trap range), or as Dana concisely defines it 'the belts of limestone . . . which extend southward in eastern New York and from Canaan and Salisbury in Connecticut' (In Connecticut *Thuja* is known only from Canaan and Salisbury!).

"In Pennsylvania, according to Porter, *Thuja* is 'Generally escaped from cultivation, but not definitely known in the native state'; and Long likewise emphasizes that the tree 'appears to be quite unknown in a native state in the wide mountain area of Pennsylvania'."

[2] Fernald, Lithological Factors limiting the Ranges of Pinus Banksiana and Thuja occidentalis, RHODORA, xxi. 42–67 (1919)—Contrib. Gray Herb. n. s. no. LVIII.

Subsequently, I am informed, *Thuja* has been found as a native along the mountains of Pennsylvania but that hardly justifies the impression that it covers the state. At the same time (map, l. c. p. 45) I showed its occurrence over a large area west of Hudson Bay; and its extreme localization in Nova Scotia is well known.

Juniperus virginiana, Eastern Red Cedar, appears from the map (p. 108) to extend northeastward along coastwise Maine into southern New Brunswick and the length of mainland Nova Scotia. But neither the Nova Scotian botanists nor those of New Brunswick know of it in their provinces, and in Maine it is confined to the southwestern corner of the state. Similarly, the maps show as Nova Scotians some other species which were unknown to Dr. Roland when he published his *Flora of Nova Scotia* in 1944: such species as *Salix nigra*, *Quercus macrocarpa* and *Tilia americana*, for example.

Many other mapped ranges in the Northeast are even more misleading. For the sake of simplicity, these will be noted in their order in the new book, although I am omitting mention of various native trees which are not included by the author.

Eastern Cottonwood, *Populus deltoides*. The map (p. 124) shows a conspicuous blank extending from northeastern New York to Lake Ontario, thence southward across central Pennsylvania and all the region eastward. Had its author consulted House's *Annotated List of Ferns and Flowering Plants of New York* he could have read: "Frequently or locally abundant across the State from Lake Champlain west to Jefferson county (outside of the Adirondacks), Lake Ontario and Lake Erie. Increasingly common southward and westward, especially along the larger streams and river valleys."

Black Walnut, *Juglans nigra*, is shown as having its northeastern limit extending from eastern Massachusetts across southwestern New Hampshire and southern Vermont to northeastern New York and thence westward and southward; but it is certainly not native in central and eastern Massachusetts and the acute botanists of Connecticut say: "derived from planted trees" but "Probably native at North Canaan" (in the northwestern corner of the state and near its native stations in extreme western Massachusetts). For New York House says: "northward to

Rensselaer, Washington and Saratoga counties, the Mohawk valley, Lewis and Jefferson counties and westward to Lake Erie. Rare in the Chemung and Tioga regions." That clips off much of northeastern New York.

Carya. Three species are mapped as extending into Maine. Hyland and Steinmetz, *Woody Pl. Me.*, consider only one of them indigenous, the others planted from outside the state.

River-Birch, *Betula nigra.* The map shows a broad northeastern tongue extending from southwestern Connecticut to northwestern Massachusetts, thence, by way of central Connecticut, Massachusetts and southwestern New Hampshire, into the eastern half of the latter state. This is very misleading. There is no evidence of it in western and central Massachusetts nor in western New Hampshire. Its localization in New England is at the southwestern corner of Connecticut and (about 150 miles away) in northeastern Massachusetts and adjacent southeastern New Hampshire!

Gray Birch, *Betula populifolia.* The northeastern portion of the map (p. 152) northeastward from a line extending from Prince Edward Island to the region of Montreal, seems to extend the species far outside its true range. There is certainly none of it on the Gaspé Peninsula, but its place is there taken by the technically very different *B. caerulea-grandis* Blanchard[3], unknown to the writer of the new book.

Quercus. The northern range of *Q. alba* stops, so far as we know, in central Maine; it does not extend, as indicated on the map, into New Brunswick. *Q. stellata* is made to occur all over Massachusetts. Actually its northeastern limit is on Cape Cod.

Witch-hazel, *Hamamelis virginiana.* The map shows it covering not only the Gaspé Peninsula of Quebec, where it does not occur, but extending out the North Shore (Côte Nord) to a point opposite the western end of Anticosti Island. Victorin, Fl. Laurent., gives its eastern limit in Quebec as the Isle of Orleans, more than 350 miles southwest of the unfortunately mapped northeastern limit.

American Mountain-ash, *Sorbus americana.* The map (p. 248) shows the northern limit of this really very distinct species to extend in a regular arc from southeastern Labrador to north-

[3] For discussion of this species see Fernald in Rhodora, xx. 171–173 (1922).

western British Columbia, its southern limits in the West to be in New Mexico, Arizona and southern California. For a tree that is a most extraordinary range. Apparently the *Synopsis of the North American Species of Sorbus* by Dr. G. N. Jones in Journ. Arn. Arb. xx. 1–43 (1939) did not influence the author. Jones correctly gives the range of *S. americana* as "Newfoundland to northeastern Minnesota, southward across northern Illinois to eastern Tennessee and North Carolina". But Preston's range extends it 400 miles north of the known northern limit of the species and about 1700 miles northwest of the northwestern limit and about the same distance to the west of the southern limit in the Appalachian Mts. That would seem to be a big enough error; but look at the illustration (p. 249). In his key Preston correctly says "leaflets usually lanceolate and acuminate", but he (or his artist) shows short oblong-elliptic round-tipped leaflets such as never occur in *S. americana*, but are similar to those of the western *S. scopulina* Greene. Ho, hum!

Downy Service-berry, *Amelanchier arborea.* Here, again, though with mapped range only 700–800 miles out of the way, the author of the new book has gone astray. I happen to know *A. arborea* since, in Rhodora, xliii. 563, t. 672, fig. 2 (1941), I pointed out the necessity to take up the name. *A. arborea* is a tree occurring from northern Florida to Louisiana and eastern Oklahoma, north to southwestern New Brunswick, southeastern and central Maine, southwestern Quebec, southern Ontario, northern Michigan and northeastern Minnesota. Its range was correctly stated and a good map published in Dr. G. N. Jones's *American Species of Amelanchier,* Ill. Biol. Monog. xx. no. 2, 36–39, map 5 (1946). Nevertheless, true to form, the new map shows it, incorrectly, extending to the extreme eastern corners of Newfoundland and the southern parts of the Labrador Peninsula, 700 miles out of the way.

Black Hawthorn, *Crataegus Douglasii* (p. 252) has its eastern extension remarkably truncated at the western edge of Minnesota. In nature, however, it abounds in some areas of southern Ontario and northern Michigan.

Common Choke-cherry, *Prunus virginiana.* Here the author includes both the eastern and the western trees, about which there may be a difference of judgment; but the eastern tree (or

shrub) surely does not occupy a full half of the Labrador Peninsula, as he indicates.

Mountain Winterberry, *Ilex montana*, is a characteristic upland species, occurring from western Massachusetts across New York State, thence south on the uplands to Georgia, Alabama and Tennessee. This chiefly montane range is not clearly brought out by a map (p. 290), showing a solid broad band extending eastward to eastern Massachusetts, eastern Connecticut, Long Island and the outermost coast from New Jersey to Georgia, etc. The wholly appropriate specific name really gives a clue.

Wahoo or Burning Bush, *Euonymus atropurpureus*. The astonishing map shows a northeastern tongue stretching from eastern New York across all of New England, except northern Maine, and on into New Brunswick; the eastern limit south of New York cutting across Pennsylvania to Ohio, thence southwestward. Surely the species is not native in New Brunswick nor New England, but it is certainly native in eastern Virginia. Enough said.

One could go on and on with other maps which sadly ignore or distort readily available facts, but my laments over the Redbud, Hoptree, Striped Maple, Black Ash, etc., would be much like the others.

These are enough, however, to show that the author of the very attractive new book has not very carefully scrutinized the ranges, but the deferred Spruces and Larches should be noted. The maps show the White Spruce, *Picea glauca*, and the Black Spruce, *P. mariana*, as both extending solidly northward to Cape Chidley (lat. 60° 33′), at the eastern entrance to Hudson Bay; but, as long ago as 1896, the great Canadian explorer of the Labrador Peninsula, Low,[4] pointed out that "The tree-line," after skirting Ungava Bay, "turns southeast, then southward [not northeast, then northward] to the neighborhood of Hebron, in latitude 58°"; and (pp. 34, 35) Low pointed out that on the Labrador Peninsula the White Spruce falls far short of this northern limit of trees. Cape Chidley, however, would seem from the new book to be only a way-station in the northward range of *Conifers*. Look on p. 44, where Tamarack, *Larix laricina*, is imagined to extend way across to Baffin Island and

[4] A. P. Low, Geol. Surv. Can. Ann. Rep. n. s. viii. 31 L (1896).

then north to the Arctic Circle! Polunin, in his *Botany of the Canadian Eastern Arctic*, i. (including Cape Chidley) says (p. 39): "*Gymnospermae* are unknown in our area", and nothing suggesting a tree is known on Baffin Island!

I have, naturally, not checked on the regions with which I am not somewhat acquainted or about which I have learned from authoritative sources; but when I read, under the heading "TROPICAL FOREST REGION," that "In . . . extreme southern . . . California are forests made up largely of tropical species", I naturally wonder and at once turn to Abrams's masterly *Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs*, Bull. N. Y. Bot. Gard. vi. no. 21 (1910). Abrams seems not to have realized that his flora was "largely of tropical species" and a check on the ranges of Mexican *Pinaceae* recorded in Standley's *Trees and Shrubs of Mexico* shows only one or two Californian species which push down to the Tropic of Cancer and these only on the mountains, well above the tropical zone. Simply because many typical plants of the eastern United States are now being found on mountains of Mexico south of the Tropic of Cancer, we do not call the Alleghenian forest a tropical one. Along the eastern margin of the United States, particularly on or near the Coastal Plain, at least 175 of the indigenous species extend northward to Virginia, Delaware, New Jersey, Long Island or southern New England (or even Nova Scotia) from the West Indies, Mexico or Central America. But we do not, on this account, call the flora of the northeastern border of the United States a really tropical one. There subarctic, Canadian, north-temperate, western European, isolated south-temperate, tropical and other elements more or less commingle, the result of dramatic geographic changes in the topography and past connections of the region. The geographic classification of the floristic elements of this and most other large areas is not a simple problem.

Chaney, who certainly knows the history of California trees, places the presence of a subtropical forest in California at fifty million years ago, not in present time: "A study of the history of the earth and its life indicates that there has been a gradual cooling and drying of the climate since the days, fifty million years ago, when the redwood lived in Alaska and when a sub-

tropical forest covered California"—Chaney, Redwoods of the Past, 4 (Pub. Save-the-Redwoods League, 1941). It hardly seems possible that the recent statement started there.

Enough has been noted to make evident the need for much greater care and scrupulous checking before attempting to instruct a public, which does not know accuracy from inaccuracy. The attractive book, which by the mere chance that a copy of it suddenly appeared on the table near me, is as good an example as are some other grossly inaccurate ones which are in vogue as authoritative books on phytogeography. This severe criticism is made in all friendliness, and, if a new edition is ever called for, it is to be hoped that it will be prepared with more attention to the actual ranges of the trees discussed.

Rhododendron maximum at Medfield, Massachusetts.—In July 1950, I visited the Rhododendron Reservation in Medfield, Massachusetts, and found that conditions there had greatly improved and that the shrubs had spread and were flowering very well.

The Trustees decided there was too much water in the swamp, and drained off the surplus. It also seemed that the shade was too dense, so a number of trees were removed to let in more light, but not too much. As a result of these corrections the shrubs seem to have taken on new life and bid fair to rival the station at Fitzwilliam, N. H.—Clarence H. Knowlton, Hingham, Massachusetts.

Goodyera tesselata in Rhode Island.—The early lists of New England plants mention *Goodyera repens* as occurring in the State of Rhode Island, but make no mention of the occurrence of G. *tesselata* in this State.

Before the destructive hurricane of 1938, I found in Rhode Island two flourishing colonies of a Rattlesnake-plantain whose flower-stalks were small and slender, averaging about 6″ tall, and all without exception with distinctly one-sided racemes. Both colonies were growing under pines in rather damp situations. I believed these to be *Goodyera repens*. The hurricane and subsequent clearing up of damaged trees completely obliterated both

colonies, so that for several years I knew of no *Goodyera* in Rhode Island, except the rather common *G. pubescens*.

However, in the early fall of 1948, Mr. John B. Hudson found a colony of *Goodyera* plants, obviously not *pubescens*, growing in moist woods under hemlocks in the town of Glocester, R. I., and we later visited the colony together. At first we both assumed them to be *G. repens*, but when we found rather thick-stemmed plants 10″ or more in height and with the flower-raceme cylindrical, we began to suspect that some, at least, of the plants might be *G. tesselata*.

We, therefore, on August 12, 1950, collected two specimens, both in fruit, one with a cylindrical raceme and the other with a one-sided raceme, and I took both to Dr. Fernald, at the Gray Herbarium, for a positive identification. Dr. Fernald identified both as *G. tesselata*, but suspected that there may have been some hybridizing with *G. pubescens*, which is frequent in the same woods.

Dr. Fernald believes that the plant which in the early records was called *G. repens* was the plant which is now called *G. tesselata*. Some of these records were made before *tesselata* was recognized with us as a species, that is, when only *pubescens* and *repens* were being recognized, so that a plant which was clearly not *pubescens* must have been considered to be *repens*.

It appears likely that the smaller plants with one-sided flower-racemes which were destroyed by the 1938 hurricane were really small specimens of *G. tesselata*. It is doubtful that *repens* has ever been found in Rhode Island.—Charles S. Bryan, Providence 6, R. I.

Misprints and other typographical Errors in Gray's Manual.—Those who detect misprints, wrong letters, omissions from indices, etc. in the 8th edition of Gray's Manual will confer a favor by calling them to the attention of the Director of the Gray Herbarium, that the more serious errors may be corrected in the second printing. Omissions of species, etc. will be assembled toward a later series of Addenda.—Send corrections to the Gray Herbarium, 79 Garden Street, Cambridge 38, Mass.

Volume 52, no. 622, including pages 229–252, was issued 13 October, 1950.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

REED CLARK ROLLINS, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
RICHARD ALDEN HOWARD
CARROLL EMORY WOOD, JR.
} Associate Editors

Vol. 52. December, 1950. No. 624.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

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Subscriptions (making *all remittances* payable to RHODORA) to
Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

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2. A Revision of the Genus Rumfordia. By B. L. Robinson.
3. A Synopsis of the American Species of Litsea. By H. H. Bartlett.
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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 52. **December, 1950** **No. 624**

ON THE APPLICATION OF THE NAME ARNICA LESSINGII (TORREY & GRAY) GREENE

BASSETT MAGUIRE

THERE has come to my attention only recently a paper[1] on Canadian plants by Dr. Boivin in which he discusses *Arnica Lessingii* (Torr. & Gray) Greene. Unfortunately, Dr. Boivin has been led into an error of interpretation, no doubt as a result of one of citation made by me in my monograph of the genus.[2] Not only has Dr. Boivin misapplied the name *Arnica Lessingii* (Torr. & Gray) Greene, displacing this binomial by the otherwise properly applied *Arnica louiseana* Farr ssp. *frigida* (Meyer ex Iljin) Maguire (l. c. p. 209), but he has unwittingly proposed a new name *Arnica Porsildiorum* Boivin (l. c. p. 210) for the valid and correctly assigned *Arnica Lessingii;* thereby he adds one more hyponym to the distressingly long list in the genus *Arnica*, and further compounds the original error.

First of all (as all contemporary students of the genus have recognized), two distinct species are involved, both of trans-Bering distribution. *Arnica louiseana*, in Alaska the ssp. *frigida*, is a beautiful plant with large usually solitary and usually gracefully nodding heads, dense yellowish pilose subinvolucral pubescence, and *yellow anthers*. It belongs to the subgen. *Arctica* and is most closely related to *A. alpina* (L.) Olin. The second, *Arnica Lessingii*, also an attractive plant, is much less conspicuously pubescent, and has smaller sharply and stiffly

[1] Boivin, Bernard, Centurie de Plantes Canadiennes. Nat. Canad. 75: 202–227. 1948.

[2] Maguire, Bassett. A Monograph of the Genus Arnica. Brittonia 4: 386–510. 1943.

nutant heads, and *purple-black* anthers. This species belongs to the subgen. *Andropurpurea*, and is probably most closely related to *A. unalaschcensis* Less.

I agree entirely with Boivin that Greene clearly intended to make the transfer, or more accurately to elevate the status of Torrey and Gray's *β Lessingii* to specific rank; that he did so validly; and that it was not his intent to propose a new species (although most specimens annotated in Greene's hand as *A. Lessingii* are actually *A. louiseana frigida*, which at that time had no valid name).

The simple answer to the confusion so needlessly set off by me lies in the typification of the basonym *Lessingii*. The type is at the New York Botanical Garden. It consists of the single well-preserved specimen with a sharply and stiffly nutant head and *purple-black* anthers. The label bearing the printed designation "Torr. & Gray, Flora N. Amer." is annotated in Torrey's hand, "A. angustifolia β Lessingii". Thus, the type of *A. angustifolia β Lessingii* Torr. & Gray is definitely fixed and, it follows likewise, the type of *A. Lessingii* (Torr. & Gray) Greene. So, then also the application of the binomial *Arnica Lessingii* is definitely affixed to the clear-cut trans-Bering species with naked rhizomes, sharply nodding heads, and *purple* anthers.

Torrey and Gray (l. c. 1843) had misinterpreted *A. alpina* Lessing (which is *A. louiseana frigida*) and erroneously associated their *β Lessingii* with it, but at the same time had properly characterized their variety as having "anthers blackish," as indeed they are! Gray (l. c. 1884), probably lacking the type, which is at the New York Botanical Garden, not only erroneously transferred var. *Lessingii* to *A. alpina* var. *Lessingii*, but likewise characterized the anthers incorrectly as "not blackish." Obviously, he was not dealing with the population with black anthers. Greene (l. c. 1900) validly effected the nomenclatural transfer, whether or not under misinterpretation of specimens. Iljin (l. c. 1926) interpreted *A. Lessingii* (Torr. & Gray) Greene correctly, as did Rydberg (l. c. 1927), Hultén (l. c. 1937) and Maguire (l. c. 1943). However, Rydberg to some extent confused the synonymy by assigning *A. alpina* var. *Lessingii* Gray "in part" to *A. Lessingii* (Torr. & Gray) Greene, and "mainly" to *A. Sancti-Laurentii* Rydb. (= *A. louiseana* ssp. *frigida*).

Maguire further confused the synonymy by erroneously assigning *Arnica angustifolia β Lessingii* Torr. & Gray to *Arnica louiseana* ssp. *frigida*, while at the same time correctly assigning *Arnica alpina* var. *Lessingii* Gray to that entity. My bracketing together the citation of these two distinct entities in the synonymy of *Arnica louiseana* ssp. *frigida*, is a *lapsus* that I cannot explain.

Boivin (l. c. 1948) misinterpreted *Arnica Lessingii* (as a result, no doubt, of my error of citation), applying the name to plants that properly come under the trinomial *Arnica louiseana* ssp. *frigida;* and proposed the hyponym *Arnica Porsildiorum* Boivin for properly applied *Arnica Lessingii* (Torr. & Gray) Greene.

The correct names, proper authorities, and pertinent synonymy for the two species discussed are as follows:

Arnica louiseana Farr subsp. frigida (Meyer ex Iljin) Maguire, Madroño **6:** 153. 1942. *A. alpina* Less. Linnaea **6:** 233. 1831; Herder, Bull. Soc. Nat. Mosc. **40:** 423. 1867. Not (L.) Olin, Diss. 11. 1799. *A. alpina* var. *Lessingii* Gray, Syn. Fl. N. Am. **1**[2]**:** 383. 1884, not *A. angustifolia β Lessingii* Torr. & Gray, Fl. N. Am. **2:** 449. 1843. *A. nutans* Rydb. N. Am. Fl. **34:** 328, 1927. *A. Sancti-Laurentii* Rydb. N. Am. Fl. **34:** 328. 1927. *A. brevifolia* Rydb. N. Am. Fl. **34:** 329. 1927. *A. Mendenhallii* Rydb. N. Am. Fl. **34:** 329. 1927. *A. Illiamnae* Rydb. N. Am. Fl. **34:** 331. 1927. *A. Lessingii* Boivin, Nat. Canad. **75:** 209. 1948, not *A. Lessingii* (Torr. & Gray) Greene, Pittonia **4:** 167. 1900.

Type: *J. F. G. Eschscholtz*, St. Lawrence Bay (and Eschscholtz Bay), 1815–18, Herb. Meyer. Leningrad. Type of *A. frigida* Meyer ex Iljin.

Arnica Lessingii (Torr. & Gray) Greene, Pittonia **4:** 167. 1900. *A. montana β angustifolia* Hook. Fl. Bor.-Am. **1:** 330, in part, 1833. *A. angustifolia β Lessingii* Torr. & Gray, Fl. N. Am. **2:** 449. 1843, not *A. alpina* var. *Lessingii* Gray, Syn. Fl. N. Am. **1**[2]**:** 383. 1884. *A. obtusifolia* Torr. & Gray, Fl. N. Am. **2:** 451. 1843, not *A. obtusifolia* Less. Linnaea **6:** 236. 1831. *A. obtusifolia* var. *acuta* Raup, Contr. Arnold Arb. **6:** 213. 1934. *A. Porsildiorum* Boivin, Nat. Canad. **75:** 210. 1948.

Type: *Captain Mulgrave*, Kotzebue's Sound, *sine no.* New York Botanical Garden. Not at the Greene Herbarium as suggested by Maguire (l. c. p. 488).[3]

The New York Botanical Garden

[3] **A CORRECTION IN TERMINOLOGY**—It is desirable at the same time to call attention to an additional error, one in terminology, made by me in my monograph of the genus Arnica (Maguire, Bassett. Brittonia **4:** 386–510. 1943). On page 400 I offered the following definition: "The periclinium begins at the point of insensible transition of peduncle into capitulum and terminates at the base of the involucral bracts." This usage was incorrectly attributed to Cavillier in his study of the genus *Doronicum* (Cavillier, F. Ann. Cons. Jard. Genève **14:** 215 and pl. 4. 1910). Cavillier properly used the term in its traditional and etymologically correct sense to indicate the involucre.

The term *hypocephalum* does accurately designate this region of such taxonomic importance in *Arnica* and other *Compositae*. It should so be read in all instances where I have used the term *periclinium*.—B. M.

ARNICA MOLLIS AND A. LANCEOLATA

M. L. FERNALD

BEING asked why, in the 8th edition of Gray's Manual (1950), I do not maintain the eastern *Arnica lanceolata* Nutt. as distinct from the cordilleran *A. mollis* Hook., I am presenting a somewhat detailed reply.

Although most students of the group have found no fundamental specific characters to distinguish the more common *Arnica* of eastern Canada, northern New England and northeastern New York from the cordilleran *A. mollis* Hook., Dr. Bassett Maguire in his *Monograph of the Genus Arnica* in Brittonia, iv. no. 3 (1943), especially on pp. 471, 474 and 475 and 477–481, keeps them apart as wholly satisfactory species. This is the more striking since he sees only subspecies, varieties, races, etc., in other localized plants of Newfoundland and the Gaspé region which have far more stability than does *A. lanceolata* Nutt., reputedly strictly eastern representative of the supposedly strictly western *A. mollis*. At two different times in the past I have published my conclusion, based on a stack of herbarium-sheets which closely crowd two standard pigeon-holes; but, in view of the seeming conclusiveness of Maguire's treatment, we find eastern botanists calling the plant of Quebec, New Brunswick and New England *A. lanceolata*. To this group I do not belong.

In Maguire's key (his p. 471) we get the two elements separated as follows:

A. Cauline leaves 4–10 pairs (rarely only 3, and then the periclinium not long-stipitate-glandular), coarsely serrate, or serrate-dentate.
  B. Periclinium long-stipitate-glandular
    C. Cauline leaves 5–10 pairs (rarely only 3–4); heads 5–9 (rarely 1–3); plants of western North America..23. *A. amplexicaulis.*
    C. Cauline leaves 4 or only 3 pairs (rarely 5); heads 1–3 (rarely 5); plants of northeastern North America....25. *A. lanceolata.*

. . . . . .

A. Cauline leaves 3 pairs (rarely 4), denticulate, seldom serrate; periclinium long-stipitate-glandular.
  B. Heads radiate.
    C. Immature heads erect, lower portion of stem and leaves not lanate-pilose; pappus tawny, mostly plumose, the setae 0.3 (0.24)–0.45 (0.6) mm. long.....26. *A. mollis.*

Noting that the last "C" is in contrast with *Arnica Parryi*, not with no. 24, *A. lanceolata*, we are left, as the key-differences between the "northeastern" *A. lanceolata* and the western *A. mollis:*

Cauline leaves 4 or only 3 pairs (rarely 5) and if only 3, then the periclinium not long-stipitate-glandular, the leaves coarsely serrate of serrate-dentate; heads 1–3 (rarely 5)....*A. lanceolata.*
Cauline leaves 3 pairs (rarely 4), denticulate, seldom serrate; periclinium long-stipitate-glandular.....*A. mollis.*

Now Nuttall's original description of *A. lanceolata* said "stem leaves about three pairs, semiamplexicaule." In a subcespitose or closely tufted plant it is difficult to say just what have been counted as cauline leaves, for very often the definitely petioled leaves extend well up the stem, while in the minor *A. mollis*, var. *petiolaris* Fern. of relatively low altitudes in New England and eastern Canada, nearly all the cauline leaves taper at base to petioles; 2 or 3 pairs of cauline leaves are the rule in the eastern plant; 1, 4 or 5 very exceptional. Surely, however, the individuals with 3 pairs have just as many stipitate glands on the involucre as do the others. The character "heads 1–3 (rarely 5)" would give a more accurate picture of the eastern plant if the parenthetical phrase read (rarely –9). The great majority of flowering stems of the eastern plant have 1 or 3 heads, those in the Gray Herbarium giving the following percentages: 1 head, 37%; 2 heads, 12%; 3 heads, 43%; with 4, 5, 6, 7, 8 and 9 making up meagre portions of the remaining 8%. In the fuller account, p. 477, the number of heads of the western *A. mollis* is given as "1–3 (5)", exactly as for the eastern *A. lanceolata;* and, although from the key one gathers that plants of *A. lanceolata* with pairs of cauline leaves "only 3 [a common number]" have "the periclinium not long-stipitate-glandular", the full description (p. 475) clearly says of it "periclinium obviously long-stipitate-glandular." Thus one becomes quite perplexed and resorts to leaf-outline, toothing and other characters. Any variation of leaf-outline and toothing in the leaves of *A. mollis* can be promptly matched by those of *A. lanceolata;* so can the involucres, both in shape and size, and the achenes.

After a third study of the two isolated branches of *Arnica mollis,* I find myself as incapable as heretofore of seeing two species in it.

In its segregation into two areas, one in western, the other in eastern North America (especially in southeastern Canada or the adjacent northeastern United States) it becomes a member of a very large group of species with similarly disrupted range. They were long ago isolated by the development of the arid Great Plains, the aridity and the increased alkalinity of the standing waters evidently excluding many of the terrestrial and most of the aquatic species of the two relict areas. In view of his well known tendency to "split" whenever possible, it is significant that Rydberg treated as identical such western and eastern groups of many bicentric species: for instance, *Potamogeton Robbinsii*, *P. obtusifolius*, *P. amplifolius*, *P. epihydrus*, *Najas flexilis*, *Scirpus subterminalis*, *S. heterochaetus*, *Habenaria unalascensis* (*Piperia*), *Goodyera oblongifolia* (*G. decipiens*), *Corallorhiza striata*, *Arenaria macrophylla* (*Moehringia*), *Cerastium beeringianum*, *Parnassia Kotzebuei*, *Dryas Drummondii*, *Oxytropis foliolosa*, *Hedysarum Mackenzii*, *Osmorhiza obtusa*, *Vaccinium ovalifolium*, *Lonicera involucrata*, etc., etc. These and *Arnica mollis* belong in the same geographically disrupted group.

But how different would seem to have been Rydberg's work on *Arnica!* Of 43 species of *Arnica* described or named by him 42 are reduced to outright synonymy by Maguire. Of the value of such wholesale reduction I am not in a position to judge. Both of these authors maintained as distinct species *A. mollis* and *A. lanceolata*. I am, after repeated attempts, unable to follow either of them in this specific separation; and so many points in Maguire's extended monograph show inattention to details, that one naturally wonders about the finality of the work.

On his p. 494, he published, as fig. 21, a map said to show "World distribution of the genus *Arnica*." In North America his southern boundary for the genus extends across Lake Winnipeg, thence slightly south of Hudson Bay, thence northward into the northern half of the Labrador Peninsula, and finally with a continuous tongue running southwestward from the eastern half of the Labrador Peninsula and easternmost Newfoundland without a break to Florida, thus including all central, eastern and southern Newfoundland, the Magdalen Islands, Prince Edward Island, southern New Brunswick, Nova Scotia, southern Maine, southern New Hampshire, southern Vermont, Massachusetts,

Rhode Island, Connecticut, Long Island and southern New York, New Jersey and much other terrain where no *Arnica* is known. On the other hand, the exclusion of any *Arnica* from the region of Lake Superior (map 21) is not easily reconciled with his map 6 (on p. 429), where his *A. lonchophylla*, ssp. *arnoglossa* is shown from just north of Lake Superior. Map 6 also shows *A. lonchophylla*, ssp. *chionopappa*, i. e. *A. chionopappa* Fern., with many stations in the waters of the Gulf of St. Lawrence, along the eastern half of the North Peninsula of Newfoundland, whence it is unknown; while the single New Brunswick station, calcareous ledges at Sisson Gorge on the Tobique River, emptying into the St. John in northwestern New Brunswick, is mapped as being in the noncalcareous eastern section, near the mouth of the Mirimichi which empties into the Gulf of St. Lawrence. Again, the endemic *A. Whitneyi* Fern. (appearing as *A. cordifolia*, ssp. *Whitneyi* (Fern.) Maguire), is correctly stated on p. 452 to be known only from Keweenaw County, Michigan, but on the map (fig. 10) it seems to be recorded from other counties and even to occur south of the Straits of Mackinac. Be that as it may, the gap of 250 miles north of Keweenaw Peninsula, on map 21, before reaching the southern limit of the genus in that longitude, is not supported by the facts which the author himself definitely stated.

Turning to Europe, the same disregard of readily available data is unfortunately evident. Map 21 shows all of Sweden supporting the genus, but the southwestern half of Norway lacking it, although reference to Hartman, Skand. Fl. 8 (1879) would have shown that *Arnica montana* in Norway extends northward to Trondhjem. The detailed map of Hultén's Atlas (1950) shows this southern Norwegian area, but no *Arnica* in Sweden except in the southern half of that country. Southeastward in Europe Maguire's map shows a tongue extending only to the Pyrenees. Had he consulted such an old standard as Nyman's Conspectus he would have found Spain and Portugal both entered for *A. montana*. Consultation of the Compend. Fl. Española of Lázaro e Ibiza, ed. 3 (1920) would have shown not only two characteristic illustrations of the plant, but the statement that it occurs on the mountains across northern Spain ("Montañas elevatas del NE., N. y O."). Similarly Pereira

Coutinho's Flora de Portugal (1913) would have given full confirmation of its occurrence in Portugal. Singularly enough (and somewhat sadly), Maguire's map 19 (p. 487) of the range of *A. montana* has a single dot for the Cantabrian Mts. of northern Spain, but even that did not get on the ostensibly complete map (21) of the full range of the genus.

All this digression from *Arnica mollis* may seem superfluous, but when an author so far departs from the conceptions and conclusions of others as does the author of the extended treatment of *Arnica*, it becomes important to check his accuracy in other details. It seems evident that a reconsideration of the genus and its distribution may become desirable. That Maguire now sees that some of his statements have been misleading is clear from his article which immediately precedes this discussion.

EXTENSION OF SOLIDAGO ERECTA.—When a species new to Quincy, Massachusetts, an area well explored by the earlier botanists, is found, it seems worthy of a brief note.

While collecting desmids in the little pools of the old Quincy quarries, what at first I took to be *Solidago caesia* L. attracted my attention because the upper leaves were reduced, contrary to the usual way in that species. As I was getting desmids, not flowering plants on that trip, I merely grabbed one specimen. Being wholly unfamiliar with *Solidago erecta* Pursh, it was not until I had reached home that I discovered I had found this species and not *Solidago caesia*.

Mr. F. W. Hunnewell kindly confirmed my recollection that it had not previously been found north of Cape Cod, Massachusetts. The one (alas!) specimen has been deposited in the herbarium of the New England Botanical Club. Perhaps further exploration will uncover stations for this southern species to fill in the gap between Cape Cod and Quincy.—FRANK C. SEYMOUR, Tomahawk, Wis.

DEEP-FREEZING FLOWERS FOR LABORATORY INSTRUCTION IN SYSTEMATIC BOTANY

Reed C. Rollins

Electrical deep-freezing machines are widely used in American homes for the preservation of frozen foods. Their general availability and economical operation suggested the possibility of their use to preserve fresh botanical material for use in laboratory instruction. Apparently a number of persons have been similarly impressed by such possibilities and at least two short notes, Baker (1949) and Harrington (1950), have appeared indicating success in this direction. However, in 1948, when I began preparations for a test run on a variety of different flowers that might appropriately be used in teaching taxonomic botany, no guiding information was available. Now, a fairly wide selection of angiosperm flowers has been used in laboratory instruction after having been preserved in a deep-freezer for periods of eight to fourteen months. For teaching purposes, the superiority of these materials over pickled or dried specimens is very striking. Not only are the shapes and color of most flowers kept intact, but even the characteristic odors are preserved in many instances. The results obtained, I believe, justify the prediction that a deep-freezer will become an indispensable adjunct to most taxonomic laboratories and may be found very useful for instruction in other branches of botany. It is particularly needed in areas where the seasons preclude easy access throughout the year to flowering plants growing in the wild. But even in the warmer climates, the deep-freezer may be used to keep material for introduction to the students in a more logical sequence than is often possible from naturally growing plants.

The advantages of frozen flowers are similar to those of fresh material over dried or pickled specimens. The student is permitted to formulate a three-dimensional concept of the flowers studied and may easily obtain an accurate picture of the positional relationships of the flower parts. When first removed from the freezer, the flowers are frozen stiff. As thawing takes place, they become less turgid and ultimately wilt. It has been found effective to pass the specimens to the students in the frozen

condition so that preliminary observations may be made immediately. Dissections follow as the material becomes sufficiently pliable to allow manipulation.

Containers.—Some attention has been given to methods of packaging, in an attempt to find the most effective procedures and the most satisfactory containers for the purpose. Two types of stiff wax-impregnated paper containers were used. One type was cylindrical in shape, with a tight-fitting lid. This type was of pint ($3\frac{3}{8}''$ in diam.) and quart ($4\frac{1}{4}''$ in diam.) size. These are designated "round unsealed" in Table I. The material was placed directly into these containers, with no additional sealing except for the tight-fitting lid. The other type of container was a rectangular waxed paper carton of pint or quart size, together with an individual removable inner pliofilm bag. These are designated "rectangular sealed" in Table I. In using the latter, specimens were sealed inside the pliofilm bag by using heat to meld the edges together. The sealed bag was then placed inside the paper carton for storage.

Preparation of Material.—In preliminary trials, it was found that wilted specimens did not become turgid when placed in the deep-freezer. They froze in the wilted condition and were unusable. To prevent wilting, specimens were collected in a vasculum. If any wilting occurred, the cut ends of the stems were put in water until turgidity was restored. Flowers, or flower-clusters snipped from larger specimens, were put loosely into containers that in turn were placed immediately into the deep-freezer machine. The material was not pre-frozen in a special low-temperature compartment.

Flowers collected when rain was falling, or otherwise wetted before freezing, were in general unsatisfactory. Ice crystals commonly formed over the tissue-surfaces, or the parts became embedded in large or small pieces of ice. This made it difficult to handle the specimens for class distribution, although in most instances they were not completely ruined.

Sealing containers.—The commonest failure was caused by the drying-out of specimens. The sealed pliofilm bags were slightly more effective in preventing excessive drying than were the cylindrical containers, but more work was involved in putting up the material. Manufacturers recommend the use of an ordinary

clothes iron for sealing the pliofilm bags, but I found a hot incandescent electric light bulb to be equally effective and much less trouble. A half-inch margin at the open end of the bag was pressed momentarily against a lighted, firmly anchored light bulb. Sealing was immediate. The rectangular cartons, each holding a pliofilm bag, are easy to stack efficiently in the freezer and require much less room than comparable storage space provided by the cylindrical containers. The principal reason for using small individual cartons was to prevent crushing and facilitate finding the particular species when ready for use. However, if space is at a premium, I see no reason why a number of sealed pliofilm bags should not be put together in a larger carton than was used in these trials. In favor of the cylindrical cartons, it should be stated that they are easier to fill and material may be removed at intervals without breaking a permanent seal. These are items of convenience not to be too heavily discounted. An important consideration is the amount of unfilled space in a bag or carton. In those instances where the amount of material left the available space less than half-filled, there was more frequent drying-out than when the container was completely filled. This varied somewhat with the nature and succulence of the specimens but was sufficiently consistent to form the basis for a definite recommendation that the containers be full or nearly full for best results. On the other hand, pressing or packing the specimens too closely is not a good practice, for they freeze together and become distorted in shape.

Temperature.—No special mechanism for temperature control, other than that already on the General Electric deep-freezer, was used. The regulator was set to keep the temperature below − 10° C. Actually, as set, the regulator permitted a range from − 10° to − 20° C. (+ 18° to − 4° F.). This temperature range seemed satisfactory for the purpose and was not altered during the test.

Results.—The results of deep-freezer trials on a variety of plants are presented in tabular form below. We have attempted to give an overall estimate of the usefulness of the method for each species, in the column "satisfactory vs. unsatisfactory for laboratory use." There was no attempt to try material from every family of the Angiosperms, those species most easily

available being used. However, the range of material is sufficiently wide to demonstrate the effectiveness of the method. The results are really self-evident, but an examination of the table points up the fact that either type of container is satisfactory for the purpose. By far the largest majority of flowers showed good color and texture. The most common wilting time, after the material was taken from the freezer and exposed to the open air of the laboratory, was between 10 and 60 minutes. In general, there was ample time for the student to make proper preliminary observations before wilting set in, and in only a few cases was wilting so rapid that the material was unsatisfactory for laboratory use.

To give the interested person the benefit of my experience, the following items in connection with procedure are noted:

(1) Be sure the specimens are neither wilted nor wet when placed in the deep-freezer.

(2) Prevent drying of the specimens by placing them in sealed or semi-sealed containers.

(3) The bulk of the specimens should exceed half of the total space inside the container for best results.

(4) In order to permit easy removal and separation of the material, do not pack it too tightly.

(5) In general, relatively small containers (i. e. half-pint, pint or quart size) are preferable to larger ones because they eliminate crushing due to the weight of a large mass of material. However, this depends in part upon the size and type of material being frozen, as well as the nature of the prepared specimen. I have usually frozen only the flowers and fruits, and these have been supplemented with dried specimens for teaching purposes.

(7) The temperature of the deep-freezer should be below the freezing point of water at all times. Fluctuations from − 10° to − 20° C. (+ 18° to − 4° F.) were not harmful to the material and allowed for a considerable margin of safety in connection with the operation of the machine.

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TABLE I

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	<10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Gramineae												
Agropyron repens (L.) Beauv.		×	×		×				×	×		
Anthoxanthum odoratum L.	×		×		×				×	×		
Danthonia spicata (L.) Beauv.		×	×		×				×	×		
Festuca rubra L.		×	×		×				×	×		
Cyperaceae												
Carex stricta Lam.	×		×		×			×		×		
Araceae												
Arisaema Stewardsonii Britt.	×		×		×			×		×		
Calla palustris L.		×	×	×	×	×					×	Thawed and refrozen.
Symplocarpus foetidus (L.) Nutt.	×		×		×			×		×		
Commelinaceae												
Tradescantia virginiana L.		×	×		×		×			×		Wilts rapidly; dissected under water.
Juncaceae												
Juncus effusus L.		×	×		×				×	×		
Luzula campestris (L.) DC.	×		×		×				×	×		
Liliaceae												
Maianthemum canadense Desf.	×		×		×			×		×		Container open; material somewhat dry but good.
Polygonatum pubescens (Willd.) Pursh.	×		×		×			×		×		Bag broken; material still good.
Uvularia perfoliata L.	×		×		×			×		×		
Orchidaceae												
Cypripedium acaule Ait.	×		×		×			×		×		
Salicaceae												
Salix humilis Marsh, var. microphylla (Anderss.) Fern.	×		×		×				×	×		
Myricaceae												
Comptonia peregrina (L.) Coult.		×	×		×			×		×		
Corylaceae												
Alnus rugosa (Du Roi) Spreng.	×		×		×			×		×		
Betula populifolia Marsh	×		×		×			×		×		
Ostrya virginiana (Mill.) K. Koch	×		×		×			×		×		
Fagaceae												
Fagus grandifolia Ehrh.	×		×		×			×		×		
Quercus velutina Lam.	×		×		×				×	×		
Santalaceae												
Comandra umbellata (L.) Nutt.		×	×		×			×		×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Aristolochiaceae												
Asarum canadense L.	×		×		×				×	×		Thawed and refrozen but still very good.
Polygonaceae												
Polygonum persicaria L.		×	×		×			×		×		
Rumex acetosella L.		×	×		×			×		×		
Phytolaccaceae												
Phytolacca americana L.		×	×		×			×		×		
Caryophyllaceae												
Lychnis alba Mill.	×		×		×		×			?		Wilts rapidly; difficult to dissect.
Saponaria officinalis L.		×	×		×			×		?		Difficult to dissect.
Silene cucubalus Wibel		×	×		×					×		Wilted on removal.
Ranunculaceae												
Anemone quinquefolia L.	×		×		×			×		×		Flowers rapidly brown on thawing.
Aquilegia canadensis L.	×		×		×		×			×		Flowers retain odor.
Caltha palustris L.	×		×		×		×			×		Quite soft when thawed.
Ranunculus acris L.		×	×			×					×	Wilted at time of removal.
Ranunculus bulbosus L.		×	×		×			×		×		
Berberidaceae												
Berberis vulgaris L.	×		×		×				×	×		
Podophyllum peltatum L.		×	×		×				×	×		
Magnoliaceae												
Liriodendron tulipifera L.		×	×		×			×		×		Retain shape well.
Magnolia denudata Desrouss. (fls.)	×		×		×			×		×		Characteristic odor present.
Magnolia denudata Desrouss. (frt.)		×			×				×	×		
Lauraceae												
Sassafras albidum (Nutt.) Nees var. molle (Raf.) Fern.	×		×		×			×		×		
Papaveraceae												
Chelidonium majus L.	×		×		×		×			?		Difficult to dissect when wilted.
Dicentra canadensis (Goldie) Walp.		×	×		×			×		×		
Cruciferae												
Barbarea vulgaris R. Br. (fls.)	×		×		×			×		×		Wilts only partially when thawed.
Barbarea vulgaris R. Br. (frt.)		×	×		×			×		×		Wilts only partially when thawed.
Brassica campestris L.		×	×		×			×		×		Wilts only partially when thawed.
Capsella bursa-pastoris (L.) Medic.	×		×		×			×		×		Wilts only partially when thawed.
Dithyrea Wislizenii Engelm.		×	×		×			×		×		Wilts only partially when thawed.

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Saxifragaceae												
Philadelphus inodorus L.		×		×		×		×		×		Dried in container.
Saxifraga virginiensis Michx.		×	×		×			×		×		
Hamamelidaceae												
Fothergilla major (Sims) Lodd.	×		×		×				×	×		
Rosaceae												
Crataegus (hybrid)	×		×		×			×		×		Browns rapidly.
Potentilla simplex Michx.	×		×		×			×		×		Wilts only partially.
Prunus pensylvanica L.	×		×		×			×		×		
Pyrus melanocarpa (Michx.) Willd.	×			×	×			×		×		Thawed and refrozen before use.
Rhodotypos scandens (Thunb.) Mak.		×	×		×			×		×		Wilts only partially.
Rubus sp.		×	×		×			×		×		Wilts only partially.
Leguminosae												
Cercis canadensis L.	×		×		×			×		×		
Cladrastis lutea (Mich. f.) K. Koch.	×		×		×				×	×		
Robinia pseudoacacia L.		×	×		×				×	×		
Trifolium pratense L.		×	×			×				×		Partially dried in container.
Wisteria sinensis Sweet	×		×		×			×		×		
Geraniaceae												
Geranium maculatum L.	×		×			×		×		×		Slightly wilted on opening; petals fall easily.
Oxalidaceae												
Oxalis stricta L.	×		×			×	×				×	Very soft when thawed; difficult to dissect.
Polygalaceae												
Polygala paucifolia Willd.	×		×		×			×		×		
Euphorbiaceae												
Euphorbia cyparissias L.	×		×		×			×		×		Soft but easily dissected.
Celastraceae												
Celastrus scandens L.		×	×		×			×		×		
Aceraceae												
Acer negundo L.	×		×		×			×		×		
Acer platanoides L.	×		×		×			×		×		
Hippocastanaceae												
Aesculus glabra Willd.	×		×		×			×		×		
Vitaceae												
Vitis Labrusca L.		×	×		×				×	×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Tiliaceae												
Tilia americana L.		×	×		×				×	×		
Malvaceae												
Hibiscus syriacus L.	×		×		×				×	×		Mucilaginous quality preserved.
Guttiferae												
Hypericum perforatum L.		×	×			×			×	×		Partly wilted on opening.
Violaceae												
Viola fimbriatula Sm.	×		×		×			×		×		
Onagraceae												
Oenothera biennis L.		×	×		×			×		×		Top flowers partially dried.
Araliaceae												
Aralia nudicaulis L.	×		×		×			×		×		
Cornaceae												
Cornus alternifolia L. f.		×	×		×			×		×		Stand up well on thawing.
Cornus amomum Mill.		×	×		×			×		×		Stand up well on thawing.
Cornus stolonifera Michx.	×		×		×				×	×		Stand up well on thawing.
Ericaceae												
Pieris floribunda (Pursh) B. & H.	×		×		×				×	×		
Rhododendron canadense (L.) Torr.	×		×		×			×		×		Wilts only partially; pores on anthers good.
Vaccinium angustifolium Ait.	×		×		×			×		×		Flowers change from white to dirty brown.
Vaccinium corymbosum L.	×		×		×			×		×		Flowers brown in ½ hr.
Primulaceae												
Trientalis borealis Raf.	×		×		×		×			?	?	Wilts on exposure.
Styracaceae												
Halesia carolina L.		×	×		×			×		×		Gynoecium difficult to dissect.
Symplocaceae												
Symplocos tinctoria (L.) L'Her.	×		×		×			×		×		
Oleaceae												
Forsythia (hybrid)	×			×		×				×		Wilted on removal; softens excessively.
Syringa vulgaris L.	×		×		×			×		×		
Apocynaceae												
Vinca minor L.	×		×		×		×			×		
Asclepiadaceae												
Asclepias syriaca L.		×	×		×			×		×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Labiatae												
Trichostema dichotomum L.	×		×		×			×		×		
Solanaceae												
Solanum triflorum L.		×	×		×			×		×		
Scrophulariaceae												
Linaria canadensis (L.) Dumont	×		×			×		×		×		Somewhat wilted in container.
Linaria vulgaris Hill	×		×		×			×		×		
Pedicularis canadensis L.	×			×		×		×		×		
Veronica serpyllifolia L.	×		×		×			×		×		
Bignoniaceae												
Catalpa bignonioides Walt.		×	×		×			×		×		
Plantaginaceae												
Plantago lanceolata L.	×		×		×			×		?	?	Difficult to dissect.
Rubiaceae												
Houstonia caerulea L.	×		×		×			×		×		
Caprifoliaceae												
Lonicera Morrowi Gray	×		×		×		×				×	Corolla wilts rapidly to pulpy mass.
Sambucus canadensis L.		×	×		×			×		×		Browns rapidly on thawing.
Viburnum bitchiuense Mak.	×		×		×			×		×		Browns after thawing.
Campanulaceae												
Campanula rapunculoides L.	×		×			×		×			?	Dry in container; too little material.
Lobelia cardinalis L.		×	×		×			×		×		
Compositae												
Antennaria plantaginifolia (L.) Hook.	×		×		×			×		×		
Agoseris cuspidata (Pursh) Raf.		×	×		×			×		×		
Aster ericoides L.		×	×		×			×		×		
Cichorium intybus L.		×	×		×			×		×		
Chrysanthemum leucanthemum L.		×	×		×			×		×		Rays wilt rapidly.
Helianthus annuus L.		×	×		×				×	×		
Senecio aureus L.		×	×			×		×		×		
Silphium perfoliatum L.		×	×		×			×		×		
Solidago sempervirens L.	×		×		×			×		×		
Vernonia noveboracensis (L.) Michx.		×	×		×				×	×		

NEW PLASTIC AID IN MOUNTING HERBARIUM SPECIMENS

W. ANDREW ARCHER

THE proper mounting of plant specimens on sheets for permanent reference is one of the factors which lead to high costs in herbarium maintenance. In an attempt to shorten the process, plastics have been under investigation for a period of years. The use of plastic as described below has resulted in considerable saving of time and yields a better mount with higher permanence than anything used up to the present in herbarium practice.

Preliminary experiments with plastics as an aid in mounting herbarium specimens were made first with Duco cement. This cement, however, contains cellulose nitrate, a substance subject to disintegration after a period of years. Other plastics, such as ethyl cellulose or cellulose acetate, are considered permanently stable and consequently suitable for herbarium purposes.

Acting on suggestions first made by Dr. G. R. Fessenden, formerly of the U. S. Department of Agriculture, and later by chemists of the National Bureau of Standards and of the Dow Chemical Company, various combinations of ingredients were tested, leading finally to the following formula: Toluene—800 cc.; methanol—200 cc.; ethyl cellulose (Ethocel) standard 7 cps.—250 gr.; plasticized with Dow Resin 276 V-2—75 gr. (The two latter ingredients are available only from the Dow Chemical Company, Midland, Michigan.)

To use the medium for mounting, the specimen is weighted down on the herbarium sheet with any convenient small objects placed at proper intervals to keep the plant flat. The plastic is applied by means of an ordinary, 6 ounce oil-can in a thin band over the part to be fastened, and the specimen then left in place for about 20 minutes to permit evaporation of the solvent and hardening of the plastic.

At present the plastic is substituted for nearly all of the sewing usually involved in the technique of mounting with tape or glue. It is particularly useful for mounting coarser plants such as grasses, sedges, palms and oaks. The results are satisfactory enough to warrant adoption of the method as a standard herbarium practice.

This note is presented in the hope of encouraging further improvement of the method. A special type of container might be designed to dispense the plastic in variable quantities according to the need. Furthermore, technical supervision is required to maintain the various components in a moisture-free condition, otherwise the plastic may become milky instead of transparent upon drying. This fact might render the method impractical for many herbaria, but some commercial house might stock the preparation ready for use were the demand sufficient.

Herbarium, United States National Arboretum,
Beltsville, Maryland

Dalea alopecuroides on Plum Island, Essex County, Massachusetts.—On September 3, 1950, while birding on Plum Island in the region known as "Hellcat Swamp," I noticed an unfamiliar legume. Taking the specimen, which grew in sandy soil four miles south of the Plum Island Causeway, I found it was apparently *Dalea alopecuroides*. The identification was confirmed by Dr. L. M. Perry of the Arnold Arboretum, and the plant added to the Essex County herbarium. Gray's Manual, 8th edition, gives the range as "adventive east to New York," but Dr. Stuart Harris kindly informs me that there are two previous stations from the state, one on South Boston flats, the other in the Arboretum, and that the Plum Island plant is the first known outside of metropolitan Boston. Since this area is not much travelled and the thickets sometimes yield species of birds rare or accidental in the state, one may speculate whether the seeds were brought in by their agency.—Dorothy E. Snyder, Peabody Museum, Salem.

Volume 52, no. 623, including pages 253–280, was issued 20 November, 1950.

ERRATA

Page 19, line 22; for *Boutelous* read *Bouteloua*.
Page 19, line 25; for *texana* read *texanus*.
Page 20, line 6; for *Sueada* read *Suaeda*.
Page 20, line 11; for *Barlandieri* read *Berlandieri*.
Page 22, line 11; for COMPRESSUES read COMPRESSUS.
Cover No. 614, line 22; for **alpine** read **alpina.**
Page 36, line 1; for CYNOSCIDUM read CYNOSCIDIUM.
Page 40, lines 17, 26, 27, 38; for *Liatrus* read *Liatris*.
Page 51, line 11; for *Otto* read *Orator*.
Page 53, line 14; for CANADENSIS read CANADENSE.
Page 58, line 23; for PLOX read PHLOX.
Cover No. 617, line 12; for **Formadehyde** read **Formaldehyde.**
Page 75, line 4; for *coscinodon* read *Coscinodon*.
Page 79, last line; for *Uva* read *Uva-*
Page 86, line 10; for PAPILLARIS read PAPILLARIA.
Page 95, last line; *for* Fig. 1 *read* Fig. 2.
Page 96, line 4; *for* Fig. 2 *read* Fig. 1.
Page 100, line 10; for *Podestelides* read *Podostelides*.
Page 126, line 7; for **fuscicolus** read **fuscicolor.**
Page 126, line 8; for *fuscicola* read *fuscicolor*.
Page 126, line 9; *for* 1939 *read* 1839.
Page 126, line 23; for *fuscicolus* read *fuscicolor*.
Page 131, line 24; for *stewardsonii* read *Stewardsonii*.
Page 155, line 7; *for* Ell. *read* Darl.
Page 158, line 6; *for* tules *read* rules.
Page 172, line 3; for ELEAEGNIFOLIUM read ELAEAGNIFOLIUM.
Page 173, line 11; for HEMAESPHERICUS read HEMISPHERICUS.
Page 177, line 26; *for* enthusuastic *read* enthusiastic.
Page 180, line 34; for *cassionoides* read *cassinoides*.
Page 183, line 3; *for* Herbaium *read* Herbarium.
Page 193, line 8–9; for *carolina-septentronalis* read *carolinae-septentrionalis*.
Cover No. 621, line 21; for **238** read **228.**
Page 210, line 34; for *villosum* read *villosus*.
Page 232, lines 12 & 13; *for* Chattachoochee *read* Chattahoochee.
Page 234–35, last of key; read 9 for 8; 10 for 9; 11 for 10; 12 for 11; 13 for 12.
Page 238, line 30; *for* 1940 *read* 1840.
Page 251, line 40; *for* forword *read* foreword.

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